DEAR COLLEAGUES,

It is our pleasure to present to you the annual English digest issue of our "Plastic pipes" journal. We have selected for you the most interesting and captivating entries published in our magazine throughout 2015.

It has been a difficult year for the Russian plastic pipe industry and for the entire Russian economy. In fact, it was probably the most difficult of the last 17 years (since 1998). The plastic pipe market decreased by 25%, many of its participants could not withstand the competition and were forced to cease production. Not only small and medium, but also large modern enterprises, producing goods that met international quality standards, were forced to withdraw from the market.

However, the market is still alive. The decrease in funding for the construction and repair of public utility networks only exacerbates the problems of utility sector and increases the potential of the plastic pipe market. Its strongest participants search for new opportunities to increase efficiency, optimize business processes and reduce costs. The weak ones, on the other hand, start using surrogate materials, illegal customs and tax schemes. Strong companies use the crisis to create and develop new efficient products and technologies, implement them in projects and further expand their usage. The world's leading companies localize their manufacturing facilities in Russia, thereby creating conditions for lower prices on their products for Russian consumers and ensuring a strong position for the future.

As Winston Churchill said, “never let a good crisis go to waste”. Only time will show how members of the post-Soviet plastic pipe market will seize the opportunities that this crisis has put before them. And we shall have the unique chance to observe this fascinating process and, where possible, participate in it.

Miron Gorilovskiy,
Editor-in-chief

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Publisher:
POLYPLASTIC Group

Editor-in-Chief:
Miron Gorilovskiy

Deputy Editor-in-Chief:
Alexander Sazonov

Project Manager:
Mikhail Burenko

Production Editor:
Alexander Sazonov

Editorial Board:
Kirill Trusov, Ekaterina Krivosheina, Maxim Baranovskiy

Address:
18, Ochakovskoye Shosse, Moscow
119530 Russia
Tel. +7 (495) 745 6857 ext. 1230
E-mail: journal@polyplastic.ru

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TECHNOLOGIES & MATERIALS

PLASTIC PIPES APPLICATION

PERSONS

TEPPFA FORUM 2015

TEPPFA Forum 2015, hosted by The European Plastic Pipe and Fitting Association, took place on the 13–14 April in the Le Plaza Hotel in Brussels. The Forum highlighted the latest developments and many of the major issues surrounding the plastic pipe technology industry. The Forum had wide-ranging appeal for senior business and technical representatives from all sectors of the industry, including pipe manufacturing, as well as suppliers of raw materials and manufacturing equipment.

The event attracted a range of high level speakers, including: Paul Rubig and Marcus Pretzell (members of the European Parliament), Mr. Niels Rune Solgaard-Nielsen (TEPPFA President and CEO of Pipelife International), Mr. Tony Radoszewski (PPI), Michele Galatola (European Commission), Mark Goedkoop (PRE International), Ari Ilomaki (CEN TC 350) and Christophe Sykes (Construction Products Europe).

The conference focused on two main topic areas, relating to technical and political matters.

The technical section focused on market issues, such as innovation in plastic pipe applications, replacement of traditional pipe materials, and the European plastic pipes market. Speakers also highlighted subjects relating to Corporate Social Responsibility, particularly environmental impacts and sustainability, recent recycling initiatives, Life Cycle Assessment, and resource conservation.

The political section of presentations focused on the role construction products are having in working towards a sustainable Europe, as well as the status of environment assessment for construction materials.

It was also a time to welcome new members. TEPPFA General Manager, Toni Calton welcomed Radius Systems to the Association. Radius Systems is a well-known supplier of plastic piping systems for various applications, with manufacturing facilities in the United Kingdom, Austria, Poland and Latvia. Radius Systems was represented by Mr. Andy Taylor, CEO, and Derek Muckle (Director of Innovation and Technology).

By Christian Apel

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For more information regarding TEPPFA please visit: http://teppfa.eu

AMI CONFERENCE 'PLASTIC PIPES IN INFRASTRUCTURE' 2015

The third AMI (Applied Market Information) international Plastic Pipes in Infrastructure conference took place on 14–16 April 2015 at the Millennium Gloucester Hotel in London. A wide range of infrastructure applications were covered including drinking water supply and distribution, gas transmission and distribution, drainage and sewerage, road and railway drainage, land drainage, cable protection and district heating.

The conference featured a 2-day techno-economic program alongside a focused exhibition with unique networking opportunities. Delegates and exhibitors attended from across the industry, including pipe specifiers, installers and end users, resin suppliers, additive producers, machinery makers, pipes and fittings manufacturers, testing and certification bodies, etc.

The Italian manufacturer of extrusion equipment, Tecnomatic, was the main sponsor of the event.

AMI itself provided a comprehensive plastic pipe market overview covering the general development of the European economy with multiple client studies. Moderate growth in this market was predicted. The increasing cost of energy and raw materials will be driving forces in the pipe industry, therefore innovation is vital to maintaining sustainable growth and profitability.

Network providers such as EANDIS from Belgium and the UK's United Utilities also shared their views on the current plastic pipe industry and highlighted the importance of technological innovation to guarantee the operational security of supply networks, and to achieve national environmental and economic goals.

Other delegates presented new developments and case studies on joining and installation technology, materials testing and sustainability, and developments in pipe systems.

One of the highlights was the introduction of a new generation of pre-insulated thermoplastic reinforced service pipes for district heating networks, from Austrian company, Radius Kelit. Whereas conventional flexible pre-insulated pipes have application limits of max. 95°C temperature and 6–10 bar pressure, the new Radius Kelit product can stand temperatures up to 135°C and working pressures up to 25 bar, at maximum coilable pipe diameters up to 160 mm. This innovative product offers new opportunities for flexible plastic pre-insulated pipes across Europe.

For more information regarding AMI please visit: www.amiplastics.com.

By Christian Apel

MOSCOW MAYOR SERGEY SOBYANIN VISITS AND GAZTRUBPLAST PLANT

On 12 May 2015, the Mayor of Moscow, Sergey Sobyanin, visited the POLYPLASTIC Scientific and Production Enterprise and the AND Gaztrubplast Plant. The facilities are part of the POLYPLASTIC Group and POLYMERTEPLO Group, and are situated in the Severnoe Ochakovo Industrial Zone, West of Moscow.

The head of the city saw production of ISOPROFLEX pipes and visited the laboratory, the R&D Centre for the POLYPLASTIC Scientific and Production Enterprise, and the Research Institute of POLYPLASTIC Group. Miron Gorilovskiy, General Director of the Group, told Sergey Sobyanin about the advantages of plastic pipes and their efficiency in pipeline construction and renovation. They also spoke about close and long-term cooperation between the Group and the housing and utility sector of Moscow. This has led to many innovative Group developments which were first deployed in Moscow and then spread further to all over Russia. "The plant is a large enterprise, manufacturing a great number of innovative products with our own R&D Centre. Here we develop and produce innovative goods that by many standards have completely replaced imported plastic pipes," said Miron Gorilovskiy.

It was also highlighted that import replacement was the key in the development of composite materials production by POLYPLASTIC Group during 2014–2015 and was a driving force behind expansion of the product range as well as the development and deployment of new materials and technologies in Russia.

The mayor was shown a full range of products made by the Group's plants: pipes (for gas, hot and cold water supply, heat supply, water disposal pipes and communication cables); pipeline fittings and valves; plastic manholes; and composite materials based on thermoplastics. Trenchless technologies offered by the Group for pipeline renovation and fibre optic cable deployment were also demonstrated.

"Thanks to the import replacement process, Russia now hardly ever imports plastic pipes for utility networks. This enterprise is one of the country's leading producers of such pipes and Moscow is a large consumer of these products for gas, heating and water networks", said the Moscow Mayor. He also stressed that modern construction and renovation technologies help to save time, costs and help to control tariffs as a result. "These are very important products for both Moscow and the whole country," added Sergey Sobyanin.

Press-service of POLYPLASTIC Group

POLYPLASTIC RESEARCH AND PRODUCTION ENTERPRISE LAUNCHES NEW PRODUCTION LINE

On 23 June 2015 in Engels, Saratov Region, POLYPLASTIC Research and Production Enterprise launched a high-efficiency line for plastic composite materials and highly-filled masterbatches compounding using BUSS MX105 extruder.

Vareliy Radaev, the Governor of Saratov Region, took part in the opening ceremony. “We keep and increase our production capacity, and create new lines that provide import substitution despite difficult economic conditions. This shows the scientific and production potential of domestic industry, skilled management and new prospects for Russia and Saratov Region,” he said.

BUSS kneaders are versatile modular compounding systems able to work on the most complicated tasks. New generation MX kneaders are based on the proven working principle of reciprocating screw.

Nominal output of the new line is up to 1300 kg/hour, which will give POLYPLASTIC an impressive capacity gain of 10 thousand tonnes. The output of Saratov plant for composite materials will reach 60 thousand tonnes per year as a result.

“This plant is unique in its own right because of the concentration of advanced technologies, skilled management with a hands-on approach towards new hi-tech methods, and professional staff. You manufacture a great amount of products in a relatively small place. The products are in demand in most industry sectors. This is the import substitution in its real sense,” said the Governor.

This 205 million rouble project will create the largest polymeric composite materials plant in the Russian Federation. The production process will primarily involve raw materials from domestic producers with the aim of import substitution programme implementation and meeting demands of the car industry, the construction sector and local producers of household appliances.

Part of POLYPLASTIC Group, POLYPLASTIC Research and Production Enterprise, specialises in producing thermoplastic composite materials for injection moulding, blow moulding and extrusion. The company has two production plants: one in Saratov (Engels), plus one in Togliatti, as well as a R&D centre in Moscow. The pool of over a thousand loyal customers includes Russian and foreign companies.

Source: Press-Service of POLYPLASTIC Group

FTK ROSTR IS CLOSING DOWN

Critical drop in demand for construction materials and equipment caused by a 40% fall of the primary property market is forcing market leaders out. According to Delovoy Peterburg, Federal Pipe Company (FTK) ROSTR Pipe Plant in St. Petersburg, third largest producer of plastic pipes and fittings in Russia, is closing down.

The news was reported by employees of FTK ROSTR and confirmed by market participants. General Director, Igor Bratushka, informed staff of the owners' decision to close the plant and sell the equipment. ROSTR declined to comment on the news and there were no official announcements at the time of writing.

The plant was originally opened in 2009, and went on to become one of the largest producers of plastic pipes and fittings in the North West and the third by output in Russia in 2013. The turnover of FTK was around 1.5 billion roubles per year.

In 2014, after the new technical regulations of SUE "Vodokanal of St. Petersburg" ("Water supply and disposal networks design") came into force, the plant had to modernise production in order to meet the requirements. Unfortunately, this coincided with the market entering a decline and the plant failed to recover their investment.

The closure of FTK ROSTR is a very worrying development for the plastic pipes industry and the economy of Russia. The current Russian economic reality continues to be challenging, even for the largest production companies making goods that meet tough quality standards and can compete with the world's leading producers.

POLYMERTEPLO GROUP BEGINS INDUSTRIAL PRODUCTION OF ISOPROFLEX-75A AND ISOPROFLEX-115A/1.6 PIPES

In October 2015, POLYMERTEPLO Group began industrial production of ISOPROFLEX-75A and ISOPROFLEX-115A/1.6 – two new types of flexible insulated pipes for external hot water and heating supply networks.

ISOPROFLEX-75A flexible pipes with PU foam insulation are designed for cold and hot water supply networks operating at temperatures up to 75°C (with possible short-term temperature increases up to 90°C) and operating pressures up to 1.0 MPa. ISOPROFLEX-75A carrier pipe is a multi-layer system featuring high heat- and chlorine resistance PEX reinforced with high-modulus fibre.

ISOPROFLEX-115A/1.6 enhanced reliability flexible pipes with PU foam insulation are designed for heat supply networks, operating at variable water temperatures up to 115°C and working pressures of 1.6 MPa. ISOPROFLEX-115A/1.6 carrier pipe is a multi-layer system made of high-temperature polymers reinforced with high-modulus fibre. The warranty period of ISOPROFLEX-115A/1.6 is 49 years.

For more details on technical and operating specifications of POLYMERTEPLO Group's new pipe types – ISOPROFLEX-75A and ISOPROFLEX-115A/1.6 – please check our website: www.polymerteplo.ru

Source: POLYMERTEPLO Group

OPEN DAY AT THE POLYPLASTIC URAL TRAINING CENTRE

On 24 September, the POLYPLASTIC Ural Training Centre and the Vodokanal Innovation Centre jointly hosted an Open Day. Executives and leading water company specialists from the Yekaterinburg and Sverdlovsk Region attended the event. Guests visited lectures in the training centre, attended masterclasses, talked to the experts and got answers to their questions.

Event visitors learned about innovations in welding technologies as well as, renovation and reconstruction of plastic pipelines. They were particularly interested in the welding demonstration and the innovative rapid emergency recovery technology for plastic pipeline systems.

According to these water company managers, the proper implementation of the new technologies and materials will increase reliability and significantly extend the operating life of underground networks as well as improve working conditions.

Professional education and advanced training of welders in the use of plastic materials at the POLYPLASTIC Ural Training Centre is the modern solution to the ever growing requirements of the water industry.

By Nalatiya Krivonozhenko

UPONOR TO OPEN PIPE PLANT IN RUSSIA

Uponor has announced plans to open a plastic pipes plant in Tosno, Leningrad Region. They will produce Uponor Ecoflex heat insulating pipes during the pilot stage. The company forecasts production of 1 million metres of pipes per year as part of the pilot stage.

Jyri Luomakoski, President and CEO of Uponor Group, commented: "We consider Russia an attractive market for Uponor in the future. We have been working here for over 20 years offering construction, reconstruction and infrastructure solutions. The demand for these products in Russia is growing and our long-term forecasts are based on these trends."

Source: uponor.ru

THE NEW BRAND FROM POLYPLASTIC GROUP

POLYPLASTIC Group has begun production of SPIROLINE PE helical hollow-wall pipes.

The signature feature of the SPIROLINE system is a patented thread unit that provides a reliable pipe connection. The high level of technical support and the huge variety of potential engineering solutions are both features which make this product successful.

SPIROLINE pipes are specifically designed for the construction and renovation of gravity pipelines. They are produced at the Novomoskovsk Plastic Pipes Plant in Tula Region, according to TU 2248-036-73011750-2015, as well as at Omsk Pipe Plant and at YUGTRUBPLAST Plant in Dinskaya, Krasnodar Region.

Sizes range from 360 mm to 2800 mm with hoop strength from SN2 to SN 12.

Source: Press-service of POLYPLASTIC Group

FIFA WORLD CUP 2018 WILL HAVE THE MOST RELIABLE NETWORKS

Yekaterinburg is undergoing a full scale preparation for the FIFA World Cup 2018. Reconstruction of road network is carried out in Central Stadium area. Its first stage is utility systems modification and construction of storm water drainage.

Ural division of POLYPLASTIC Group provides integrated pipes and fittings supply to the World Cup 2018 sites. CORSYS two-layer non-pressure pipes, CORSYS PRO enhanced strength and performance non-pressure pipes, CORSYS PLUS super-large diameter pipes for water supply and disposal systems were delivered to the sites in a timely manner. CORSYS ARM multi-layer reinforced pipes will be used for the construction of water disposal networks under heavy load highways.

PROTEC innovative pipes with protection layer and PE100 pipes with diameters of 600, 800 and 1000 mm were used for the construction water supply networks at World Cup 2018 sites in Yekaterinburg in addition to CORSYS pipes.

Alexander Yakob, the Head of Yekaterinburg Administration, said, "We have visited construction and renovation sites. We discussed the process of the new construction and rearrangement of the existing utility networks. We also visited construction of storm-water drainage which has never existed in this area. The modern treatment facilities will be built especially for this system near Krylov street. All these sites will make the life of the residents more comfortable."

According to A. Yakob, the sewer is easy to install and operate. The contract sets the completion deadline for March 2018, but the contractor intends to commission the sites in autumn 2017.

Uraltransspetsstroy is the contractor responsible for the construction works, who won the tender for 4.2 million roubles in April.

Extensive manufacturing capabilities and wide variety of pipe products of POLYPLASTIC Group are specially relevant for the strategic sites, where integrated supply of pipelines for water, gas and sewers are needed. These sites very often have complications with highways overloading, tight schedules for installation works and other problems of the metropolis. These projects prove the promptness of POLYPLASTIC Group's innovative solutions.

Source: россия2018.рф, www.uralinform.ru, www.ekburg.ru, www.e1.ru

OVER 400 METRES OF THE MAIN SEWER PIPELINE IN NABEREZHNYE CHELNY REPLACED

Specialists at Chelnyvodokanal have completed the renovation of two sections of the main sewer pipeline planned for this year. The total length of replaced pipeline in 58–59 areas of the new city and Zhukova street in the ZYaB township is 435 metres.

This pipeline is 18 km long and over 40 years old. Chelnyvodokanal has repaired 2.19 km since 2008 using its own funding of 188.1 million roubles. The works are all done by the company. They have tried a number of renovation techniques and chose the trenchless technology method of slip-lining PE pipes into the existing pipeline. According to Maxim Smirnovskiy, Supervisor, the works are done live without disconnecting the pipeline as there are no other sewer pipelines available. It is rather dangerous to work in these conditions, but the consumers are using the sewer without any disruptions.

The new PE pipeline will be reinforced with concrete before the beautification process starts. The works are expected to be completed in mid-July.

Source: chelny-izvest.ru

ELECTROCOR PIPES ADOPT EUROPEAN STANDARD

POLYPLASTIC Group has begun production of ELECTROCOR pipes in compliance with TU 2248-028-73011750-2015 specifications and according to the new requirements of the International Electrotechnical Commission for standardisation of electrical, electronic and related technologies, GOST R IEC 61386.1-2014 and GOST R IEC 61386.24-2014 (and similar EN European Standards).

The latest GOST R IEC 61386.1-2014 and GOST R IEC 61386.24-2014 technical specifications adopt a new set of tests: appearance, compression resistance at 5% deformation, impact resistance at –5°C, bending resistance, electrical strength, solids and water resistance at pipe joints, and insulating resistance.

Pipes are now classified by resistance to compression, bending and impact – unlike TU 2248-028-73011750-2013 where non-pressure sewer pipes are classified by hoop strength SN.

Traditionally, POLYPLASTIC Group produced cable protection pipes in red. We have now adopted inner layer colour-coding which provides a visual indicator of their resistance to compression, bending and impact i.e. blue (1250 N), yellow (750 N) and white (450 N).

The latest technical specifications also provide the ability to manufacture pipes in coils with pre-installed pulling wire (pipes in sections are not equipped with the wire) which is used for manual insertion of cables weighting up to 1500 kg.

Source: Press-Service of POLYPLASTIC Group

POLYPLASTIC OPTIMISES MANUFACTURING CAPACITY SPACE

POLYPLASTIC Group has completed a large-scale re-organisation of its production sites. The project was focused on optimising expenditure and cost savings, as well as expanding the company's presence in the composite material market.

A key decision was taken to relocate a large part of composites production from Moscow to the Saratov Pipe Plant where 8 compounding lines were deployed from 2007 in addition to the PE pipes production lines. Four lines were relocated to Saratov with a total capacity up to 15,000 tonnes per year. This meant the capacity of the Saratov composite material plant reached a total of 60,000 tonnes per year. Part of the pipe manufacturing capacity at the Saratov plant was also moved to the Italsovmont Plant in Volzhsky.

To enhance the presence of POLYPLASTIC Group in the composite materials market, it was decided to set up a car industry sector production unit in Togliatti. This division will only concentrate on this particular sector to meet the demand from AVTOVAZ and its vendors who are the largest consumers of plastic materials in the Volga Federal Region. As a result of this project implementation, the capacity of the Togliatti production facility increased to 20,000 tonnes from September 2014.

An experimental composite production facility with capacity of up to 5,000 tonnes remains at the AND Gaztrubplast plant in Moscow. This facility will be involved in the development of new composite materials designed by the POLYPLASTIC R&D Centre.

Press-Service of POLYPLASTIC Group

RBC: TOP 500 RUSSIAN BUSINESSES

RBC has published the first rating of 500 leading Russian businesses.

The companies were rated based on their revenue (excluding VAT, excise and export duties) and with priority to IFRS and US GAAP standards.

Total revenue for the companies on the list was around 56 trillion roubles. Half of the revenue of the RBC 500 is made up by the resources and electric power sectors. The RBC 500 companies employ at least 7.5 million people.

The industries dominating the rating are: oil and gas production and processing (61 companies), metals and mining (48), finance (43), retail (41), construction of infrastructure (37) and transport (37 companies). Exactly half of RBC 500 revenue comes from resources and electric power industries compared to just 10% from finance.

Gazprom, LUKOIL, ROSNEFT, Sberbank and Russian Railways made the top 5 and represent almost a third of the total revenue of all rated participants.

POLYPLASTIC Group came 403rd by revenue according to consolidated accounts revenue.

Source: top.rbc.ru

FORBES: 200 LARGEST RUSSIAN PRIVATE COMPANIES OF 2015

Forbes has represented the non-government economy of Russia in the rating of 200 companies with less than 50% of government and foreign capital. The companies are rated by 2014 revenue based on IFRS standards.

The list does not include banks, insurance, leasing, investment and other finance companies due to the substantial differences in business models and accounting processes for retail and industrial companies. The rating also excludes asset management companies but does include the companies they manage.

The total revenue for the top 200 companies was 27.2 trillion roubles – an increase of 3.1 trillion roubles compared to 2013. Almost half of the growth came from oil and gas and retail companies – 27.4% and 22.2% respectively. Public companies made up 58% of the total revenue.

Oil companies, LUKOIL and Surgutneftegaz, have traditionally led the rating. In third place is Magnit which outperformed Vimpelcom and therefore pushed them into the fourth position. Next came X5 Retail Group, followed by the largest tobacco distributor, Megapolis Group, which moved up from eighth place last year. The rest of the top ten was made up of EVRAZ, TATNEFT, Norilsk Nickel and Bashneft.

POLYPLASTIC Group came 196th with a revenue of 29 billion roubles (a 9% increase on the previous year).

Source: Forbes.ru

EXPERT RA: MAJOR RUSSIAN COMPANIES

RAEX Rating Agency (Expert RA) has presented their traditional rating of Russia's major companies. The number of participants has increased from 400 to 600, which rating creators say is due to an increase in companies that could qualify as a large business due to their size and scale. It was therefore time to include these businesses in the rating.

The major rating criterion is 2014 sales revenue (works and/or services). The rating includes companies from almost all economic sectors, with priority given to IFRS or US GAAP standards as well as polling of the companies.

Total revenue of RAEX-600 companies (the rating brand) in 2014 reached 60 trillion roubles making an 85.5% ratio to GDP.

Total revenue of the 600 largest Russian companies grew in 2014 by 13.1% which is 1.5 times more than the turnover growth indicator for all Russian companies. Whilst it is reassuring that large businesses are a dynamic segment within the economy, if this indicator is projected against inflation (which was 11.4 % in 2014 according to Rosstat) the result is stagnation. Taking into consideration the weakening rouble (the average dollar exchange rate grew by 21% in 2014) then the term "drop" can be applied, at least, to the currency equivalent of the revenue of the largest companies.

One in four of Russia's major companies ended the year with a loss. The production sector saw the worst performance with 32% of industrial companies ending the year with a loss. Specifically, this represented more than half of the iron and steel, precious metal and diamonds industry, about 40% of coal mining and engineering companies, every third chemical, petrochemical and food industry company, and every second non-ferrous metal company listed in the rating suffered a net loss.

POLYPLASTIC Group, the largest Russian plastic pipe producer, was no exception. Despite total sales revenue growth of 9% (29.0 billion roubles) 2014 ended with a loss, putting the company in 335th place out of 600.

Source: raexpert.ru

SOCAR POLYMER HAS BEGUN CONSTRUCTION OF A NEW PE PRODUCTION FACILITY IN AZERBAIJAN

SOCAR Polymer, a subsidiary company of SOCAR (the State Oil Company of Azerbaijan) began construction of a new PE production facility in the Sumgait chemical industrial park (SKSP, Azerbaijan) in October 2015. Ilham Aliyev, the President of Azerbaijan, took part in the opening ceremony.

SOCAR Polymer will produce medium and high density PE using Innovene S Process technology by Ineos Technologies. This provides a licence for Innovene as an Azerbaijani producer. The total production capacity for the plant is expected to be 120 thousand tonnes per year and will cover a wide range of PE including special bimodal PE 100 for pipe production.

The plant is scheduled to be commissioned at the end of 2018.

In April 2015 in Baku, SOCAR Polymer signed an engineering contract for the construction of an 180,000 tonne PP facility in SKSP with Maire Tecnimont S.p.A. According to the conditions of the contract, construction will be completed by the end of 2017.

30% of the goods that these new PE and PP plants will produce is planned to be used in the internal market, with the remaining 70% destined for export.

Source: mrcplast.ru

LUKOIL RESUMES PRODUCTION OF HDPE AT STAVROLEN

In April 2015, Stavrolen, a subsidiary company of LUKOIL OJSC, resumed production of HDPE after a prolonged period of downtime caused by a major accident in February 2014.

In the autumn of 2014 Stavrolen restarted production of polypropylene on a temporary basis, using an outsourced supply of raw materials from Russian companies and from neighbouring countries.

The accident at Stavrolen was a result of a fire breaking out in the ethylene gas separation unit and production was immediately stopped. The fire was finally extinguished completely 1st March. 18 people had been injured during the accident and a criminal investigation was therefore launched in accordance with the Criminal Code of the Russian Federation for violation of health and safety rules at dangerously explosive facilities. According to the special committee investigation under Rostehnadzor (Russian Technical Supervisory Authority), the fire was caused by a damaged corrugated plate in the left heat exchange section and decompression in the heat exchanger. Experts estimate the cost of reconstruction as 2.5 billion roubles.

Source: rccnews.ru

EARLY REPLACEMENT OF STEEL PIPELINE ON THE CENTRAL EMBANKMENT OF VOLGOGRAD

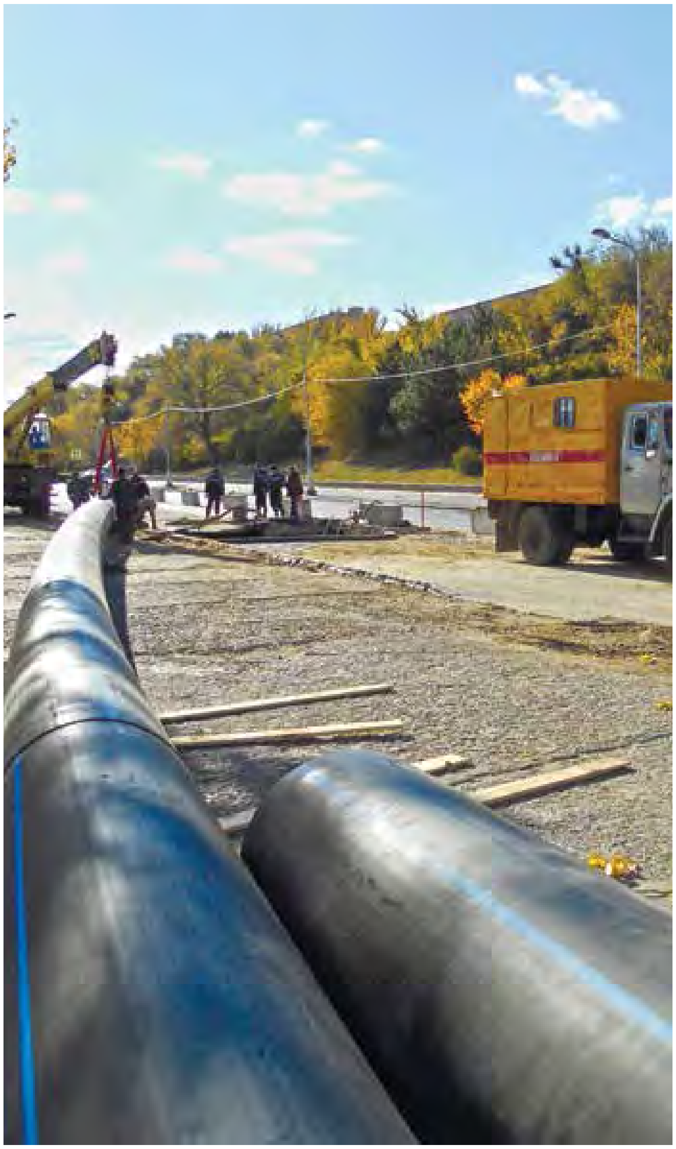
Koncessii Vodosnabzheniya has begun the replacement of the steel water pipeline on the Embankment named after 62nd Army in Volgograd. Built in the 1990s, the pipeline had been experiencing emergencies up to 60 times a year. Alexander Zhernokov, Deputy Director of Koncessii Vodosnabzheniya said the company will install 1000 mm PE pipes using a horizontal drilling method.

StroyServis, the contractor, will initially replace 1.7 km of the main water pipeline between the riverside station and 7th Gvardeiskoy Brigady Street. The contractor confirmed that the construction works will not disrupt the water supply.

Emergencies have caused suffering for local consumers and for road users. As the pipeline is laid under the road, the repair work will limit some traffic flow.

Gorvodokanal Volgograd was conceded to Koncessii Vodosnabzheniya for 30 years due to lack of funds in the Municipal Company and the fact that almost 80% of the network was worn out. According to the City Administration, the Municipal company will maintain economic management rights for communal infrastructure facilities but at the same time delegates the right for asset servicing and cost increasing. The administration also gave reassurances that this arrangement will not lead to rises in water supply and disposal tariffs for Volgograd inhabitants.

Sourse: vlg.aif.ru, v102.ru



LARGE DIAMETER VALVES IN CHELYABINSK

The Chelyabinsk Municipal Unitary Enterprise "Production Association of water supply and sanitation" continues its summer campaign to replace worn valves.

The purpose of this program is to increase the operational integrity of the city water supply, to optimise water pressure, and to provide reliable emergency response measures.

Thanks to the proactive work carried out by advisors at the Yuzhnoulaskiy branch of POLYPLASTIC Ural, it was possible to use TALIS butterfly valves with double eccentric DN900 PN10 and a shaft to Chelyabinsk for the Ufimsky Tract of the central water network.

The 10-year warranty, high quality and reliability of the TALIS valves meant the valve requirements for this important pipeline network were met fully.

POLYPLASTIC Group has extensive experience in the supply of large diameter pipe valves. In 2014, the also company supplied TALIS double eccentric butterfly valves (diameters from DN800 to DN1600) to the Rublevskaya Water Treatment Plant in Moscow.

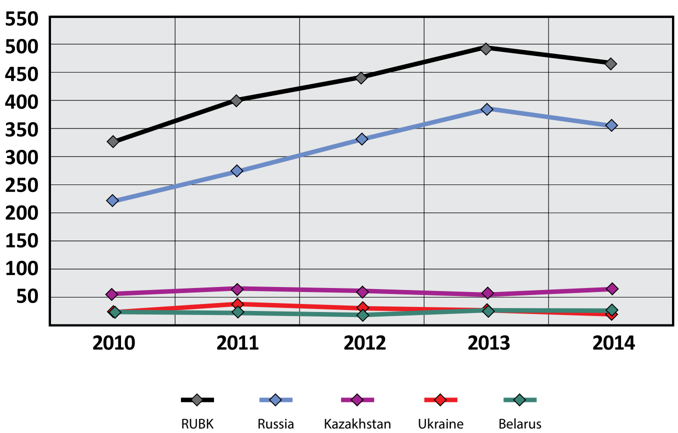
Source: Press-Service of POLYPLASTIC Group

SUMMARY OF 2014 – NO MIRACLE HAPPENED

By Mikhail Usachev, Kirill Trusov

The plastic pipes market in RUBK (Russia, Ukraine, Belarus, Kazakhstan) showed a negative trend for the first time following continuous growth from 2010 to 2013, shrinking by 5% to 467.5 thousand tonnes. The major causes of the decline were a reduction in construction activity, a partial curtailing of investment programmes, and under-financing of ongoing renovation programmes. This was compounded by uncertainty in Ukraine which led to reciprocal sanctions and a sharp devaluation of the rouble

Pic. 1. PE pipe market of RUBK in 2010–2014, thousand tonnes



Annual performance of the Russian PE pipes market was disappointing. In 2014, Russia supplied 356,000 tonnes of PE pipes – an 8% reduction on the previous year. Consumption fell due to economic slowdown and a drop in the number of large infrastructure projects during the year. The situation in the PP and PVC pipes markets was not very optimistic either. PP pipes saw a repeat of the previous year's output at 121,000 tonnes; PVC pipes reached the 60,000 tonnes mark, an increase of just 1%.

The Ukrainian PE pipes market has been in turmoil for three years. It showed a negative trend from 2012 to 2014 and shrank overall by 41% (15,000 tonnes). In 2014 market volumes were down 18% to 22,000 tonnes. Due to the economic situation in Ukraine, the markets continued to shrink. The situation worsened for plastic pipe producers reliant on imported raw material as the 5% import duty for all grades of polymers took effect from February.

Consumption of plastic pipes in Belarus in 2014 did not show significant changes compared to the previous year and came to 25,000 tonnes. However, possible market growth opportunities were completely shattered due to the reduction in a number of large government investment projects.

The Kazakhstani market was the only one to show growth in 2014. Decreases in 2012–2013 were overcome and the Kazakh PE pipes market grew by 16%. This growth was possible due to the implementation of a number of large government infrastructure projects. Kazakhstan is a bright example of successful government participation in infrastructure development. Unlike other countries, the government increased rather than reduced spending in spite of the crisis, in order to stimulate business. From 2015, Kazakhstan expected to invest around 3 billion dollars per year in the creation and modernisation of infrastructure. This will also influence the growth of PE pipes consumption.

The level of market development can be evaluated by assessing consumption of product per capita. Total plastic pipes consumption in RUBK in 2014 was 3.2 kg/person. Kazakhstan has been leading for several years, maintaining the level at 4.87 kg/person. Belarus is second at 3.90 kg/person, Russia is third with 3.75 kg/person and Ukraine is far behind at 0.74 kg/person.

RUBK plastic pipes market development is at a significantly lower level than that of Europe, Northern America and China. The consumption of plastic pipes per capita in Northern America and Europe is three times higher than in RUBK. Attention should be paid to the development of the Chinese market which has doubled the production of plastic pipes from 5.8 to more than 13 million tonnes in just over 4 years. This has almost reached European levels of 9–10 kg/person. Although there was a reduction in consumption in 2014, the plastic pipes market of RUBK does have potential for growth in the long run.

PE pipes market in Russia

In 2014 consumption of PE pipes in Russia reduced 8% due to many company and Government projects stopping or being postponed in light of the difficult economic and political situation. Large infrastructure projects, such as the Olympic Games in Sochi and APEC Summit in Vladivostok were lacking and the gas distribution development programme was stopped. Only strategically important projects like the Vostochny space-launch complex retained its investment.

Construction slowed significantly due to limited credit resources following the increased interest rate and economic sanctions. The Agency for Housing Mortgage Lending expected the mortgage market in 2015 (including government-backed schemes) to make 800 billion roubles. This is 56% less than in 2014 which saw record results of 1.76 trillion roubles. Clearly a significant drop would negatively impact the infrastructure construction rate.

The housing and utilities sector also experienced under-financing in utility networks renovation projects. The federal budget for this sector dropped by 28% to 62.2 billion roubles in 2014 and the sector entered a serious crisis situation. According to the Centre for Municipal Economy, over 44.9% of water and 40% of sewer pipelines required replacements in 2013. Only 1.5% of water and 0.4% of sewer pipelines are replaced every year instead of required 4%.

Forecasting PE pipe market volumes for 2015 is virtually impossible without any clear trends. The start of 2015 was not positive. Consumption of pipe grades of PE in the first quarter was 32% lower compared to the same period in the previous year. Such a significant reduction in raw material consumption can only point to negative market dynamics in the future.

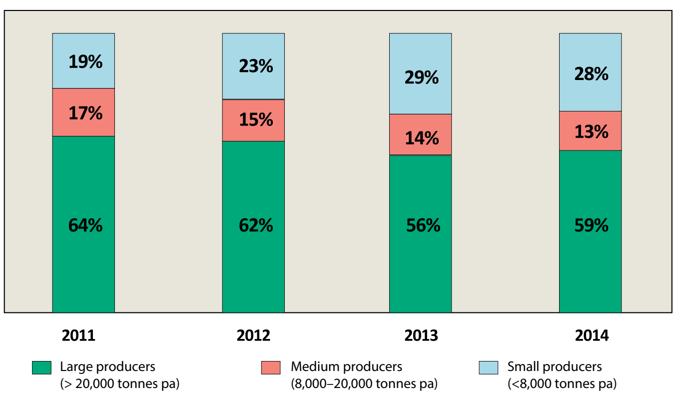
Output of PE pipes producers in 2014 was low at only 30–35% of production capacity whereas total capacity would see over a million tonnes of output.

Market share by volume amongst producers did not significantly change in 2014. The large producers slightly increased their share from 56% to 59% and the medium and small producers were 1–2% lower than in 2013. A worsening of the economy in 2015 will make it likely that the more financially resilient larger producers will be able to retain their market share.

There were some changes in PE pipe consumption. Pipe supply to the water industry – the largest market sector – went up by 65%. Pipes for gas pipelines had reduced in previous years from 26% in 2012 to 18% in 2014. The volume of gas pipes will continue to drop due to a partial suspension of the gas infrastructure development programme. The share of non-pressure pipes used for sewer pipelines, telecoms and drainage has increased in 2014 from 13% to 17%. This trend for non-pressure pipes will remain the same in 2015.

Pipe grades PE market in 2014

PE pipe producers have faced problems other than the drop in demand. In February 2014, there was an accident at Stavrolen,



Pic. 2. Market shares of PE pipes producers in Russia in 2011–2014.

the only producer of black-filled PE 80. The entire RUBK zone was left with only two local producers of pipe grade PE: Kazanorgsintez and Nizhnekamskneftekhim. In 2014, production of pipe grade PE in RUBK was 209,000 tonnes whilst consumption volume was 468,000 tonnes. This was a 55% shortfall of pipe grade PE – representing 256,000 tonnes – and had been building for a number of years. Kazanorgsintez and Nizhnekamskneftekhim benefitted from the shortage by significantly increasing prices for their products. According to the Marker Report, Kazanorgsintez made 6.1 billion roubles, a record high profit which was 2.85 times more than in 2013. Nizhnekamskneftekhim increased its net profit by 50.5% to 9.43 billion roubles.

The shortage was partially addressed by importing more expensive raw materials from Europe, Asia and Saudi Arabia. Other pipes are produced from less expensive non-pipe grade PE, however this is strictly prohibited, especially for use as pressure pipes. Many companies were forced to lower their production costs and face tough price competition – and had no choice but to produce poor quality goods. This problem was dealt with in various ways. In Kazakhstan, for example, market participants created a self-regulatory organisation (SRO) to monitor rogue producers. The Association of PE Pipes Producers made a request to the Eurasian Economic Commission to apply zero import duties for black-filled PE. As a result, the EEC took the unprecedented decision to do so for Kazakhstan only for 2015, up to a volume of 100,000 tonnes. Perhaps only Kazakhstan is interested in good quality pipes?

In 2014, Russian home produced black-filled pipe PE supplied 55% of market demand, where 54% – PE 100, 1% – PE 80. The share of imported PE 100 grew from 15% in 2013 to 24% in 2014, which was also related to the shortage of PE in the domestic market.

The share of consumption of non-pipe grades of PE dropped to 19% which may be an indication of a reduction in counterfeit produce. The reduction of PE 80 share can be explained by the Stavrolen shutdown as well as consumer preference for PE 100 which is seen as a more efficient material.

In 2015, the situation for pipe grade PE in RUBK did not improve. Total production output for Kazanorgsintez and Nizhnekamsksneftekhim shrank to 150–160 thousand tonnes, which will perpetuate the shortage. The pipe grade PE market should be more positive in 2016 however as Kazanorgsintez is planning to increase production output of pipe PE to 220 thousand tonnes. Stavrolen has also promised to introduce its own black-filled PE 100.

Prices and market trends for pipe grade PE

Local PE 100 producer prices were stable at 65,000–66,500 roubles per tonne in Q1 2014. Devaluation of the rouble at the beginning of the year meant imported raw material prices increased. European PE 100 producers increased prices from 76,000 to 85,000 roubles per tonne. Prices for pipe raw materials from Asia reached 81,000 roubles per tonne in March.

The accident at Stavrolen, along with seasonal demand increases in Q2, resulted in a significant price spike for pipe grade PE in Russia. Domestic producers of black-filled PE 100 increased their prices by 13,000 roubles per tonne to 80,000 roubles per tonne. At the same time, the price of imported PE 100 did not see a significant change, staying at 78,000–82,000 roubles per tonne during currency stabilisation. Price competition between imported and domestic raw materials intensified at the end of Q2.

Prices continued upwards during Q3 of 2014. Weighted average prices for PE 100 reached 80,000–85,000 per tonne amid high demand for PE pipes and the scheduled maintenance shutdowns at Kazanorgsintez and Nizhnekamskneftekhim. The prices for imported and domestic raw materials were almost the same.

Q4 of 2014 was a surprise for both the pipe grade PE market and the Russian economy as a whole. The prices for local raw materials reached their annual peak in November 2014 at 86,500 roubles per tonne before going down to 83,500 roubles per tonne as demand collapsed and the credit fund situation worsened. Double-slump of the rouble against the dollar made the prices for imported PE 100 pass 100 thousand roubles per tonne mark in December. Despite a significant decrease in oil prices, Asian raw materials reached 105,000 per tonne and

European PE 100 reached 115,000 per tonne.

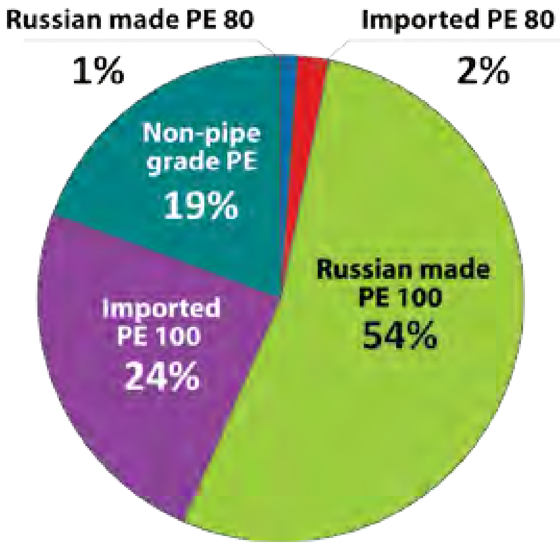
The weighted average prices for PE 100 at the beginning of 2015 were over 90,000 roubles per tonne. Local pipe grade PE producer prices did not increase significantly due to seasonal factors, only reaching 91,000 roubles per tonne in March 2015. However Asian producers of PE 100 showed record prices of 130,000 roubles per tonne. European prices significantly dropped to 96,000 roubles per tonne after the December spike due to the devaluation of the euro.

Import and Export of pipe grades PE

Increased demand for pipe grade PE, and the opportunity to sell products at an attractive price in Russia, ensured domestic producers stayed focused on the home market. Exports of pipe grade PE shrank by a third to 25,000 tonnes during 2014. Turkey, Ukraine and China became major consumers of Russian PE for pipes, bringing the total share to 81%. Kazanorgsintez covered 85% of total pipe PE exports; Gazpromneftekhim Salavat – 12%; and Nizhnekamskneftekhim – 3%.

Imports of pipe grade PE into Russia in 2014 was 1.5 times up to 94,000 tonnes. The first quarter of the year saw a serious drop in imports as the rouble devalued. Imports of pipe grade PE started to grow in Q2 and reached 15,000 tonnes in September. In Q4 imports decreased again due to the pressures of a seasonal drop in demand.

The supply geography of pipe grade PE in 2014 had seriously changed. Germany became the largest importer and increased its share from 15% to 41%. The share of Asian suppliers of PE was down and made up 47% due to a reduced supply from Korea, down to 16,500 tonnes. Thailand's share remained the same as the previous year at 29%. Supply from Saudi Arabia sharply decreased to 6%, possibly due to the fact that European import duty for PE from the Persian Gulf was increased from 3.5% to 6.5%.

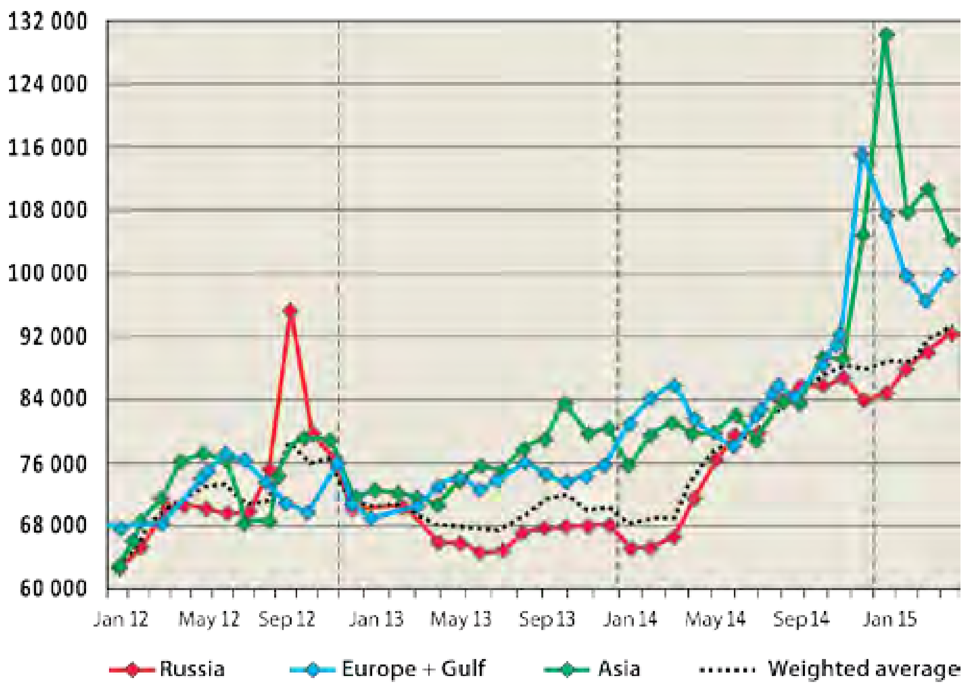


Pic. 3. Raw materials for PE pipes in Russia in 2014

Conclusion

With downward market trends, more expensive raw materials, and a devaluation of the national currency: this industry has never seen such a deep and prolonged crisis. However, each crisis must be treated as an opportunity. Difficult times force entrepreneurs to optimise business processes, enter new markets and create innovative products. Only effective and competitive companies can overcome the crisis – the rest will not survive. Sooner or later, the market will stabilise and growth will inevitably follow due to a built-up need for the construction and renovation of utility networks. The big question of course is when this will happen…

Pic. 4. Average prices for black-filled PE 100 trend, DDP Moscow, roubles per tonne including VAT, years 2012–2014.



PLASTIC PIPES AND FITTING 2015 CONFERENCE REVIEW

Source: INVENTRA publications

The Ninth International Plastic Pipes and Fitting 2015 Conference, organised by INVENTRA, part of CREON Group, took place on 8 April. POLYPLASTIC Group became a General Sponsor and Centropolimer was a partner.

Opening the conference, Sandjar Turgunov, General Director of CREON Energy, said that the colossal potential of the Russian plastic pipes market makes all participants feel confident despite difficult economic times. However, the current crisis has touched the industry as well. The domestic PE pipes and fittings market was down by 10% at the end of 2014 and shrank by a third within the first quarter of 2015 – which was worse than predicted. Staying competitive in such conditions forces processors try to minimise the costs and can result in the wrong raw materials or cheap substitutes being used. An increase in counterfeit products is a potential concern for market participants.

According to Lola Ogrel, INVENTRA Department for Analytics director, the Russian plastic pipe market has been growing. In 2003 consumption of main plastic pipes was less than 125 thousand tonnes. The demand for pipes grew 4.5 times within 10 years and reached 560 thousand tonnes in 2013. However, the PE pipes industry saw a reduction, making pipe consumption in Russia go down by 5%. This result is not so bad considering the problems with economy, said the speaker.

Raw materials supply is one of the major topics for the processors as this represents 85% of the pipe production price. The accident at Stavrolen, plus general political and economic factors, has further aggravated the situation in the polymeric raw materials segment. The Stavrolen shutdown did not affect the PP market as the shortage was filled by polypropylene from Poliom and Tobolsk-Polimer. However, the HDPE market experienced a severe shortage and suffered a sharp price increase which led to reduced PE pipes production.

Half of PP pipes are made of imported raw materials. About 40% are random and block copolymers produced by SABIC, Borealis, Hyosong Corporation, Ineos and others. Imported homopolymer is used for the other 10%. The situation for Russian pipe raw materials improved in 2014. Nizhnekamskneftekhim has resumed production of PP4132B random copolymer after a break of four years. Tomskneftekhim widened the range of pipe grades of copolymers, and Poliom began production of PP H007 EX pipe grade homopolymer for non-pressure pipe, sewer and drainage systems. The PP pipes market doesn't only

depend on imported raw materials, half of PP pipes used in Russia are made outside. It should be said that the last few years saw some positive changes, such as reduction of imported pipes from 82% to 43% and growth of PP consumption from domestic production in 2013–2014. The total consumption of PP pipes of all kinds exceeded 120 thousand tonnes. The shortage of home produced certified raw materials and the high cost of imported ones are the main constraining factors for the development of the PP pipes production industry.

Consumption of PVC pipes in Russia grew threefold over the last 10 years, reaching 60 thousand tonnes. This market is expanding mainly as a result of growing domestic production. Dependency on imported PVC pipes remained in 2014, however, the launch of RusVinyl at the end of last year, will minimise imported raw materials as this plant has the capacity to produce 300 thousand tonnes of suspension PVC, although this will not influence pipe production output.

Any increase in plastic pipes production capacity is limited by the absence of domestic manufacturers of specialised equipment, uncertain government policy in the housing and utility sector, and the stereotypical use of conventional metal pipes.

Miron Gorilovskiy, General Director of POLYPLASTIC Group, said that contraction of the PE pipes market 2014 was predicted. According to his evaluations, the volume of domestic pipe grade PE shrank by 8–9%. Belarus did not see sharp rises in PE prices or market volume. However, the Kazakhstan plastic pipes market has a very positive outlook. The speaker pointed out that it is very difficult to make any forecasts as many things depend on the exchange-value of rouble and the prices for raw hydrocarbons, but a shrinking market was likely. Regardless of relatively good demand in March, January and February had been disappointing. According to preliminary estimates, the decline in pipe grade PE in the first quarter was 32%. Mr. Golirovskiy explained that market pessimism is due to a sharp decline in orders and investments primarily in the housing and utility sector. The company is cautiously expecting possible orders for the construction of World Championship facilities in 2018 and the development of Vostochniy Space-launch complex.

According to POLYPLASTIC Group data, 2014 saw increase in domestic pipe PE 100 consumption to 54% compared to 48% in the previous year. A contraction of 44% was expected for 2015. The PE pipes share of the gas sector in 2015 should make up 16% dropping from 18% in 2014. This was due to cuts in gas infrastructure development due to the difficult economic situation. According to Mr. Gorilovskiy, in the situation like this, the industry must be aware of surrogate products made from PE grades that are not approved for pipe production. There is a positive side too – large customers are imposing scrupulous quality checks on their supplied products, which should be encouraged.

Mr. Gorilovskiy informed the conference delegates that the company intended to further develop high pressure reinforced pipes for Russia’s oil and gas industry. He cited examples of plastic pipes for gas transportation infrastructure for LUKOIL in Perm Region. There, pipes were used with diameters ranging from 500 to 630 mm for gathering and refining associated gas. These environmentally friendly and corrosion-resistant products are particularly important for the oil and gas industry.

In his speech, Mr. Gorilovskiy talked about the necessity for improving access to international certification for pipe products in order to simplify export. POLYPLASTIC plans to export 5–8% of its production in the future.

With regard to export, Mr. Gorilovskiy said that falling oil prices meant PE prices in Europe and South-East Asia had fallen, however in Russia they went up. He estimated that they would be at similar levels by May. POLYPLASTIC Group, was also considering supplying products to China on a pilot basis, preferably through a joint venture with a local manufacturer. Innovative products such as Kevlar reinforced PE pipes will be key to successful entry into the Chinese market.

Mikhail Bondarenko, Marketing Director of Pro Aqua, presented his vision of the PP pressure pipes market. Traditionally half the pipes in Russia are imported, therefore devaluation of the rouble will help Russian producers to increase their share of the market despite the decline in consumption. He also noted that imported equipment is not entirely compatible with Russian raw materials. In reality this significantly slows the production process, which is one of the constraining factors in the development of polymers processing.

The supply volume of PP pipes in 2014 did not change compared to the previous year, however, Oleg Kozlov, Technical Director of Alterplast, claimed this was due to overstocking. He believes there is a surplus of imported pipes bought at high prices with no demand in the market. A market drop of 20–50% was predicted for the end of 2015. The speaker compared demand for different pipe grades in Russia and abroad. In his view, the European market is moving towards metal-reinforced plastic pipes, PEX/PERT pipes and aluminium-free pipes whereas Russia considers PP pipes the priority. PP pipes consumption grew from 148.8 million metres in 2008 to 237.7 million metres in 2013. Mr. Kozlov noted that PP pipes are actively used for domestic networks, replacing old steel pipes. Consumption of polybutene pipes has increased fourfold since 2008, reaching 350 thousand tonnes in 2013.

Consumption of metal-reinforced plastic pipes was 129.1 million metres in 2013, down by 4.3 million metres compared to 2012, which, according to the speaker, was due to their high price.

According to data from dealers, consumption of PP fittings by heating systems and water supply industries in Russia in 2010–2013 made up 305 million dollars. Brass fittings for metal-reinforced plastic and PEX/PERT pipes reached 198 million dollars.

The plastic pipes and fittings market is stable, however participants can

turn from competitors into fellows in misfortune, said Elena Volkova, Head of Fittings and Pipe Accessories Division of POLYPLASTIC Group. The speaker confirmed that sale of fittings has been slow. Fittings are more profitable than pipes, however, customers expect complete systems rather than separate components. This type of service can deliver a more stable income in difficult economic circumstances. Each POLYPLASTIC site has a production shop for custom-made items, which gives a competitive advantage when pitching for a complicated order. Mrs. Volkova also noted that the company had found cooperation with the Kokhanovo Pipe Plant in Belarus very productive due to low prices of their products within the Customs Union.

Regarding trends in the fittings market, Mrs. Volkova expects production to follow the pipe market. Currently the fittings and accessories market as a monetary equivalent is about 12% of PE pipes sales. Having said that, it is unlikely that new participants will appear in the fittings market as they will have to establish a distribution channel for their pipe systems.

Konstantin Shepel, Representative from Immid, said that 2015 was quite a hard year for small polymer processors. The difficult economic situation and a decline in orders had a negative impact on processors in Central Russia as well as regional markets. However, he was confident that their company could retain a similar supply volume to the previous year.

Alexander Kozlov, First Deputy General Director of Domodedovo Vodokanal, talked about the use of plastic pipes at water supply and disposal facilities. 20 years ago, there were some questions about using plastic pipes, however today there are no doubts at all. Nearly 60% of municipal networks in Russia are in a critical condition. Every year 5–7% of pipelines must be repaired in order to avoid water or sewer pipe emergencies. The index is lower in reality and is due to underfunding in the housing and utility sectors as well as technical difficulties in heavily congested cities. For these reasons, trenchless replacement of steel pipes with plastic pipes is gaining popularity.

Alexander Emke, Leading Engineer at the MOSGAZ Mechanical Testing Laboratory presented his paper on “Strength properties and deformability of plastic pipes and couplers” using data from the Moscow Centre for physical and mechanical properties research of construction materials (MGTs). According to his report, PE pipes and fittings make up a significant share in total purchase volume. Every batch bought by the company goes through incoming quality control at their own research centre using a temperature range of –70 to +250°C. So far, there has only been one case of defective products identified. These were replaced by the manufacturer.

Gumer Murzakhanov, Director of the MOSGAZ Research Centre, stated that the company is not retaining the volume of orders but is increasing purchase volumes of plastic products for gas supply networks.

Nikolay Asatiani, General Director of INVENTRA, concluded the conference. He commented that market participants are competing clients by offering extra services and integrated design solutions rather than price dumping. This type of approach protects the manufacturer from a sharp decline in orders and transforms the business into a pipeline systems provider, rather than simply a supplier of either pipes, fittings, manholes or installation services.

The forecast for the near future remains uncertain. The plastic pipes and fittings market is exposed to a number of factors, including raw materials prices, exchange rates and economic stagnation. Even in such hostile conditions, market participants must continue to find solutions for utility networks, national projects, and gas distribution development. It is vital that participants continue to talk openly about the problems in the industry and find ways to address them.

EUROPEAN PE MARKET – 2015: SUSPICIOUS COINCIDENCES

By Mikhail Usachev, Kirill Trusov

Last year, the European PE market was very turbulent with prices falling in January and raising sharply in March on the back of acute shortages.

In early 2015 the prices for ethylene from European producers continued to drop due to seasonal decreases in demand and falling oil prices – which fell by 55% in six months, down to 47 dollars per barrel. Ethylene prices reached the bottom in February at a spot price of 700–710 euro, and a contract price of 819 euro per tonne. The prices for polymers followed ethylene.

As well as the fall of prices for petrochemical products, the currency market saw a devaluation of the euro which dropped 16% against the dollar during December–March when it reached the 1.05 mark. As a result of both of these factors, the European market saw relatively low prices for PE and significant product volume, which lead to a sharp increase in demand for European PE from domestic and foreign consumers. Russian producers of PE pipes were buying European black-filled PE 100 at average 1000–1100 euro per tonne on FCA terms.

However, the European market could not satisfy total consumer demand formed during the low prices period also due to reduced production volume. PE imports into Europe were significantly lower due to a weak euro and increased import duty on PE from the Middle East from 3% to 6.5% which came into effect from 1 January 2014. The European PE market therefore experienced unbalanced demand and supply.

Prices for ethylene in Europe began to stabilise after reaching a local minimum in February. Oil prices saw renewed growth in January which played a major role in increasing the price of monomers. Nevertheless, the key factor that promoted ethylene and PE prices increase is the significant excess demand over supply in the European market.

Although European PE demand was quite high, some European plants began maintenance shutdowns or announced supply force-majeure in March. This lead to a significant supply shortage in an under-served market. During March–April, spot prices for ethylene gained over 400 euro compared to the minimal index and reached 1000–1120 euro per tonne. Spot prices for blown PE grew by 350–400 euro to 1520–1530 euro per tonne within the same period (pic. 1). According to customs statistics, prices for European pipe PE grew by 150 euro for Russian consumers and reached 1150–1250 per tonne on FCA terms in March and 1280–1350 euro per tonne on FCA in April. It should be noted that a similar situation also occurred in other polymer markets including PP.

Initially, market participants assumed the various plant shutdowns were a coincidence and expected the situation to change within a couple of months, however, one after another closed and suspicions were raised. At the end of February, Total had shut down its petrochemical complex in France until 28 April – this included the new 250,000 tonnes pa ethylene cracking unit. In mid-March, Dow had stopped its plant in the Netherlands. Consumers of PE began to question whether the sequence of shutdowns of petrochemical companies really was a coincidence and filed an inquiry with the competition regulator. The producers explained the shutdowns as planned maintenance and equipment replacement. One of the explanations for the shortage which developed was that a number of European plants had all been built 15–17 years ago and therefore required repairs simultaneously.

Despite all of this, the prices for ethylene and PE continued to grow and reached the maximum in the middle of June. Spot prices for monomer rose by 300–400 euro to 1250–1260 euro per tonne. By the end of May, the prices for blown PE had grown to 1580–1590 euro per tonne. The average price for European pipe HDPE in May was 1480–1550 euro on FCA terms. The prices for pipe PE reached their peak in June. According to Market Report analysis, negotiations regarding spot prices for black-filled PE 100 for the consumers from CIS countries were in the range of 1555–1635 per tonne on FCA terms, which is approximately 131–137 thousand roubles on CPT Moscow terms.

It is no secret that the major beneficiaries in the given market situation were European producers of monomers and polymers. According to Plastics Information Europe, the European manufacturers of HDPE had an average margin of 250–300 euros per tonne in relation to contract prices of ethylene in 2014. It grew to 400 euro in March–April during the shortage and reached a record 500–600 euro in June.

At the same time, consumers suffered from overinflated prices and an extreme shortage of raw materials. European producers of plastic pipes therefore began to look for availability in other markets. Some were attracted to Russian PE whilst others purchased raw materials from Asia where the market was more relaxed compared to Europe.

The European market consumers were pleased in July when news of the petrochemical market shortages reached the EU Commissioner for Energy, who then asked the producers not to manipulate the market and reduce the prices. As a result, spot prices for monomers from the end of June to beginning of July were reduced by 80–90 euro, but the contract price for ethylene stayed at June's level of 1105 euro per tonne (pic. 1). The prices for HDPE (including pipe grades) followed the trend down. Reduced petrochemical raw materials costs and supply growth from Asian and Middle Eastern manufacturers also contributed to the PE price drop.

Market shortages remained. One European producer received an order for 90,000 tonnes of pipe grade HDPE in July at the capacity of 25 thousand tonnes per month. It therefore looked likely that ethylene and PE prices would only fall a little in following months. Russian consumers should not expect the price fall for European HDPE in roubles due to the possible devaluation of national currency, which had become a subject of discussion amongst economic experts. In the best case scenario the price for pipe grades of PE remained static and in the worst case it will increase.

Pic. 1. Prices for ethylene and blown PE in 2014–2015, euro per tonne (data from ICIS)

KOKHANOVSKY PIPE PLANT CELEBRATES 10TH ANNIVERSARY

Beltrubplast Kokhanovsky Pipe Plant, the recognised leader in the Belarus plastic pipe industry, has celebrated its first Jubilee. Alexander V. Churkin, General Director of the plant, talks about its development, main achievements and future prospects.

– Mr. Churkin, your plant turned 10 in June. How did it all start, how did the plant grow, and what were the most memorable events in its development over the last 10 years ?

– Everything started in 2005 when the Beltrubplast Kokhanovsky Pipe Plant was founded at a small production shop for service pipes made of scrap. Three modern PE pipe extrusion lines were purchased for the production of 16 mm to 630 mm pipe. The plant rapidly grew into a producer of pipes for the water and gas industries and annual production output reached about 5000 tonnes in 2007. At that time however, the company economics were not satisfactory with relatively high processing costs, and an unclear sales strategy. The management of POLYPLASTIC Group took the decision to diversify production in June 2007. In autumn of that year we began production of PE-Steel transition fittings for gas pipelines. That was just the beginning. Next we set up a rotational molding production area and then a workshop for press-fittings for hot water and heating pipelines in 2009. Then in 2013, the compression fittings moulding workshop was created.

The plant today employs less people than in 2007, yet production output has grown almost 4 times since then.

The most memorable event was the opening of metal fittings production shop in 2009.

– What achievements were the most significant over the last 10 years and what projects were most remarkable?

– I think the most significant achievement was production of hydraulic tooling for POLYMERTEPLO Group. It is rather complicated mechanical engineering item of great quality. The most remarkable project undoubtedly is the production of press-fittings for hot water and heating supply pipes made by POLYMERTEPLO. Its creation is a key element of modern metal works production.

– What kind of products does the Plant produce today and who is your main consumer ?

– The products can be split in two groups. The first one is related to pipes: smooth, corrugated, as well as drainage with diameters up to 630 mm. This year we began producing spiral wound pipes with an inner diameter up to 2400 mm. All of these products are for the Belorussian market. Our consumers are in the housing and utility sectors or construction companies. Our second group of products consists of steel press-fittings for heating pipes, the hydraulic tooling for their installation, and various items made using rotational moulding such as trays, manholes, big diameter couplings, PE-steel transition fittings and compression fittings. This group of products are delivered to the Trade Houses of POLYPLASTIC Group.

– Are plastic products in demand in the region and what is the situation on the plastic pipes market in Belarus?

– Yes, plastic pipes are in demand in Belarus. I can recall a serious discussion about the completion of gas distribution networks developments back in 2007 and thinking that production of gas pipes would cease. However, consumption of plastic pipes, including gas pipes, is not going down.

The main player is STS BelPolyplastic, our Trade House. Its robust policy is focused on the wider deployment of innovative pipe products and the displacement of conventional materials, such as steel, concrete etc.

– What place does the plant take in the Belarus market today?

– It would not be correct to comment on the place of the plant in the market as our Trade House plays the main role in the supply of plastic pipes and related products.

– The plant manufactures products that are in demand in both Belarus and via POLYPLASTIC Group in Russia. What are these products and what share do they represent?

– The products made for POLYPLASTIC represent approximately 60% of total production. This includes press-fittings for hot water and heating supply making up 40%, rotational moulding products, and miscellaneous items such as PE-steel transition pieces, hydraulic tooling and compression fittings.

– Did the Russian crisis have an impact on the market in Belarus?

– Yes, it did and it was quite severe. The plant has been building production capacity for 10 years and there was some growth even in 2008–2009, however production volume went down for more than 25% for the first time as a result of the first half-year.

– One of the success factors of POLYPLASTIC Group is continuous product development and the design and deployment of innovative products. Does Kokhanovsky plant take part in the design and implementation of these innovations?

– It sure does. We always take an active role in this process and a number of innovative products of the Group are made here. When POLYMERTEPLO developed and implemented new pipes, we developed new design fittings and hydraulic tooling for their installation and then started producing them. Together with the Group's Technical Development Department, we were the first to design and produce PE-Steel transition fittings. As part of the new project for modular manholes we produce trays and steel moulds for rotational moulding.

– What goals and ambitions does the plant have today? Where do you see the plant in about 10 years?

– Our present aim is to overcome the crisis, keep our highly qualified personnel, and maintain production levels. We also have plans for development including updating equipment and technology, production capacity growth and deployment of new products. We are quite optimistic about the future. The average age of our employees is under 40 so we have a lot to look forward and in about 10 years we will be a modern, robust and prosperous enterprise.

PLASTIC PIPES magazine congratulates the staff of Beltrubplast Kokhanovsky Pipe Plant on its Jubilee. We wish all our friends good health, confidence, new achievements and personal wealth!

Alexander Churkin shows new product samples from Kokhanovsky Pipe Plant Beltrubplast including SPIROLINE pipes, trays for module manholes and PE-steel transition fittings

PLASTIC MANHOLES: UNIFORM REQUIREMENTS FOR DIFFERENT TECHNOLOGIES

By Vilnis Puce

Currently in Russia, there are a great number of domestically-produced and imported plastic manholes in the plastic pipeline water disposal system market. Most of the main production technologies are represented. Each technology has its advantages and disadvantages, but they all fall under this unified rule – the greater the investment in technology and production it gets, the more reliable the manhole will be.

Plastic manholes for water disposal systems are installed at significant depth. They are often subjected to static and dynamic loads in the presence of a high level of ground waters. The basic requirements were stipulated in the EN13598-2 standard, and followed by GOST 32972-2014, which aims to ensure the reliable and safe operation of plastic manholes.

This overview considers how manholes produced using different technologies comply with the above requirements.

Major players and their products

PIPELIFE

– DN 900/1000, DN 900/800, DN 630 module manholes – connection diameters DN/OD 160–315 mm with limited choice of design (constructed from parts made by low pressure moulding).

– DN 1000, DN 800 module manholes – connection diameters DN/OD 160–630 mm with unlimited design (welding parts made by low pressure moulding).

– DN 630 module inspection chambers – connection diameters DN/OD 160–315 mm with unlimited design (the base of the manholes is made by welding parts made by low and high pressure moulding; the manhole shaft is completed with a two-layer corrugated pipe made using the extrusion method).

– DN 400 module inspection chambers – connection diameters DN/OD 160–315 mm with limited design (the base of the manholes is made by welding parts made by high pressure moulding; the manhole shaft is completed with a two-layer corrugated pipe made using the extrusion method).

WAVIN

– DN 1000 module manholes – connection diameters DN/OD 160–315 mm with limited design (parts are made by low and high pressure moulding).

– DN 600 module inspection chambers – connection diameters DN/OD 160–315 mm with limited design (the base of the manholes is made by high pressure moulding; the manhole shaft is completed with a one-layer corrugated pipe made using the extrusion method);

– DN 315, DN 425 module inspection chambers – connection diameters DN/OD 160–200 mm with limited design (the base of the manhole is made by high pressure moulding; the manhole shaft is completed with a one-layer corrugated pipe made using the extrusion method).

IKAPLAST

– DN 1000 module manholes – connection diameters DN/OD 160–315 mm with limited design (made of parts produced using rotational moulding; connections into the base of the manhole are made by tapping with a sealing ring or using manual extruder welding of the pipe pieces).

– DN 1000 welded manholes – connection diameters DN/OD 160–630 mm with unlimited design (the shaft/base of the manhole is made from two-layer corrugated pipe by manual extruder welding the pipe pieces, and the bottom is made of plastic sheet).

– DN 400, DN 600 welded inspection chambers – connection diameters DN/OD 160–630 mm with unlimited design (the shaft / base of the chamber is made of two-layer corrugated pipe by manual extruder welding the pipe pieces, and the bottom is made of plastic sheet).

NAWELL

– DN 1000, DN 1500 module manholes made of PE and PP – connection diameters DN/OD 110–600 mm with limited design (the assembled parts are made by rotational moulding; connections are tapped in using sealing rings or pipe pieces welded using a hand extruder).

– DN 400 module inspection chambers – connection diameters DN/OD 160–250 mm with limited design (the base of the chamber is produced by rotational moulding; connections are tapped in using pipe pieces, and the shaft of the chamber is made of a two-layer corrugated extruded pipe).

PK NIS

– DN 1000, DN 1500 welded manholes – connection diameters DN/OD 110–600 mm with unlimited design (the shaft/base is made of spiral wound pipe; the connections are welded using a manual extruder, and the bottom is made of plastic sheet).

POLYPLASTIC GROUP

– DN 1000, DN 1500 module manholes – connection diameters DN/OD 110–800 mm with unlimited design (the base of the manhole is welded of parts made by injection moulding, rotational moulding and extrusion. The shaft of the manhole is complete with a two-layer corrugated pipe made by extrusion; the cone of the manhole is produced by rotational moulding).

– DN 1200, DN 1600 welded manholes – connection diameters DN/OD 110–800 mm with unlimited design (the shaft/base of the manhole is welded of parts made by injection moulding, rotational moulding and extrusion).

– DN 600 module inspection chambers – connection diameters DN/OD 110–315 mm with unlimited design (the base of the chamber is welded together with parts made by injection moulding, rotational moulding and extrusion. The shaft of the chamber is completed with a two-layer corrugated pipe made by extrusion).

– DN 400 inspection chamber – connection diameters DN/OD 110–200 mm with limited design (the base of the chamber is made by injection moulding, the shaft is completed with an extruded two-layer corrugated pipe).

Compliance with the main articles of GOST 32972-2014

The standard compliance, GOST 32972-2014 "Plastic manholes for sewerage and drainage systems. Specifications" is based on research into the properties of thermoplastic material products, and the results of tests on samples of different products sold in Russia.

CONNECTION TO THE BASE OF THE MANHOLES

The GOST 32972-2014 clause 4.2.2 states: "Sizes and design of the manhole's sockets and spigots must comply with regulatory and technical documentation for the pipes and fittings the manholes are used for".

The manholes manufactured by PipeLife, Wavin, POLYPLASTIC are in full compliance with GOST 32972-2014.

Some GOST 32972-2014 compliance problems may occur with an in-situ connection using a sealing ring (IKAPLAST, Nawell). This kind of connection does not comply with the requirements for corrugated pipe connections. In particular, it does not ensure the necessary tightness under deformation of the pipe. Strictly speaking, manholes that are equipped with pipe connections made of smooth PE pipe (IKAPLAST, Nawell, PK NIS) do not comply with GOST 32972-2014; smooth pipes are incompatible with the regulatory and technical documentation for sewer pipes made of PVC and PP. For example, the tolerances of the outer diameter of GOST 18599-2001 pipes do not comply with the inner diameter of GOST R 54475-2011 couplers and sockets.

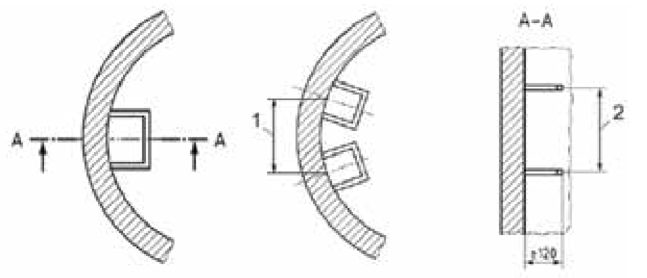
LADDER

The GOST 32972-2014 clause 4.2.3 states: "If the manhole has a ladder (climbing frames), they must be put at the distance shown on pic.1. The distance from the shaft wall should be no less than 120 mm. Note – doubled step is designed for two legs and has a width no less than 250 mm. Single step is designed for one leg and has a width no less than 145 mm. Single steps are set in a checkerboard order".

The following manholes are in full compliance with GOST 32972-2014:

– PipeLife, Wavin, POLYPLASTIC.

The following products may have some compliance problems with GOST 32972-2014:



a) doubled steps b) single steps

1 – from 270 mm to 300 mm with maximal deviation +/– 10 mm
2 – from 250 mm to 350 mm

Pic 1.

– Nawell, IKAPLAST – the single step ladder in the shaft, made by rotational moulding, does not comply with GOST as the "ladder steps /step frames" suggest the possibility of step holding according to pic. 1.

OUTER APPEARANCE OF THE SURFACE

GOST 32972-2014 clause 5.1.1: "Bulging, dents, cracks and other foreign inclusions on the surface of the manhole components made of plastic that are visible without magnification tools are prohibited.

Recommended colour for the manhole components made of PE is black, components made of unplasticised PVC and components made of PP – orange-brown.

Surface layers of manhole components with multi-layer design must have even and uniform colour".

There are possible GOST 32972 compliance problems with products made using the low pressure moulding method (PipeLife). As a result of the technology used, the surface of the products often have whitish spots and pores.

HOOP STRENGTH OF THE MANHOLE SHAFT

GOST 32972-2014 clause 5.1.4: "Hoop strength of the manhole shaft and telescopic extension must be no less that 2 kN/m^2.

Notes: Greater hoop strength may be required for the heavy grounds and over 4 metres depth".

PipeLife, Wavin, POLYPLASTIC, PK NIS manholes strictly comply with GOST 32972-2014.

There may be some GOST 32972-2014 compliance problems with the products made by rotational moulding (Nawell, IKAPLAST), as the hoop strength of the shaft directly depends on the thickness of the wall or the height of the profile. But rotational moulding does not facilitate construction with high ribbing and limits the thickness of the homogeneous wall 12–15 mm, which is not enough for a required hoop strength of no less than 2 kN/m^2.

TIGHTNESS

GOST 32972–2014 clause 5.1.6: "Manhole components assembled together must comply with the parameters set in table 2."

GOST 32972-2014 clause 8.11: "Leak tightness of base and shaft connection with sealing ring is checked on the sample of the fully assembled base with a section of the shaft no shorter

Table 2.

Indicator	Value	Testing method
1 Shaft connections tightness at the pressure of 0,1N, bar [1), 2)]	no leaks	8.9
2 Tightness of telescopic extension connection assembly [3)]	no leaks	8.10
3 Tightness of cone connection assembly	no leaks	8.10
4 Tightness of base and shaft assembly : - at air pressure of 0,3 bar [2)]; - at water pressure of 0,05 bar [2)]; - at water pressure of 0,5 bar [2)]	pressure increase ≤ 0,03 bar within 15 minutes no leaks within 15 minutes no leaks within 15 minutes	8.11

[1)] N – maximal level of ground waters above the bottom of the base in metres, but no less than 2 meters.
[2)] 1 bar = 0.1 MPa = 105 Pa.
[3)] For the telescopic extension located below 0.5 m from the ground level.

than 1 metre. The section of the shaft and other connections must be sealed in order to create inner pressure. Design of end caps must ensure leak tightness and eliminate transfer of axial load onto the connection caused by inner pressure. Pipe caps must have a port to connect to the pressure source.

The leak tightness is checked sequentially in the following modes:

– The sample is subjected to reduced air pressure at −30 kPa ± 5%, which is held for 5 minutes and then disconnected from the pressure source. The test is carried out at the ambient temperature of 23 ± 5 °C. The temperature deviation during the test must not be more than 2°C. The pressure mark for the sample in 15 minutes must be no more than – 27 kPa ± 5%.

– The sample is filled up with water of 19 ± 9°C, the air is removed, and held for at least 15 minutes. The pressure is gradually increased to 5 ± 0.5 kPa over a period of no less than 5 minutes and held for no less than 15 minutes. If the sample does not have visible leaks then the test continues…

– The inner water pressure is gradually increased over a period of no less than 5 minutes to 50 ± 5 kPa and held for 15 min. The sample must not have any visible leaks."

PipeLife, Wavin and POLYPLASTIC manholes strictly comply with GOST 32972-2014.

There are possible GOST 32972-2014 compatibility issues with the following products:

– Nawell, IKAPLAST. The tightness of the base and shaft joint and the connections to the manhole base should be achieved by using precision-sized connecting components and superior quality sealing rings. Rotational moulding technology cannot guarantee the dimensional tolerance stability of the connecting components. This disadvantage can be eliminated by post-production calibration – although this is a little-used, labour-intensive process.

– PK NIS. Human skill plays an important role in achieving the desired tightness of the seams in a welded manhole, using superior quality materials. Unfortunately, the number of reclamations for welded manholes is significantly higher than for module analogues.

TRAY DEFORMATION

GOST 32972-2014 clause 5.1.10: "Projected deformation of the flow cross section of the base canals for 50 years' service life must be:

– Vertical – no more than 5% of outer pipe diameter;

– Horizontal – no more than 10% of outer pipe diameter."

GOST 32972-2014, Annex B "Determination of design durability of the manhole base".

PipeLife, Wavin, POLYPLASTIC manholes strictly comply with GOST 32972-2014.

The durability of DN 1000, DN 1500 manhole bases to deformation at reduced inner pressure (–30 KPa ± 5%) is only possible with a spherical bottom and big wall thickness (>15 mm) or a high profile with reinforcing ribs. However, rotational moulding technology does not facilitate the manufacture of products with these parameters; therefore GOST 32972-2014 compatibility problems can be associated with Nawell and IKAPLAST products.

The bottom of PK NIS manholes is made of sheets with reinforcing ribs. To ensure its compatibility with the required standards, it must be supported by the appropriate calculations, and also depends on the quality of the welding.

IMPACT RESISTANCE

GOST 32972-2014 clause 5.1.3 states: "Manhole base must be impact resistant at free fall from the height of 500 mm at the temperature of 10°C.

Prior to fall, the sample of the base is placed with the weakest place, e.g. pipe end pointing down".

Table 3.

Load class	Test load, kN
Class A	5
Class B	50
Class D	100
Class E	150

Wavin, POLYPLASTIC, PipeLife DN 900/1000 and DN 900/800, Nawell (PE), IKAPLAST manholes strictly comply with GOST 32972-2014.

There are possible GOST 32972-2014 compliance problems with the following manholes:

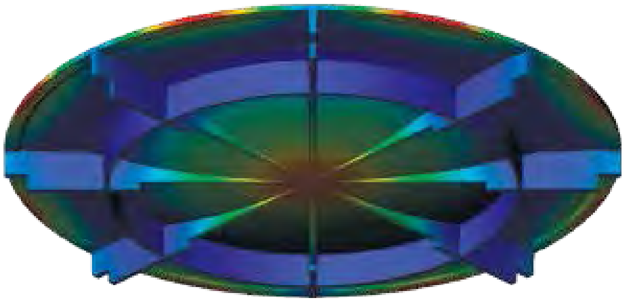
– PipeLife DN 1000 and DN 800. Welding the connecting pipes to the base with a structural wall (produced by low pressure moulding and adding nitrogen) causes risks of seam cracking on impact.

– Nawell (PP). The use of PP in rotational moulding leads to material destruction that can badly affect the product's impact resistance.

TRANSPORT LOAD ONTO THE MANHOLE CONE

GOST 32972-2014 clause 5.1.7 states: "Cones and pre-surface components of the manhole must be resistant to the load, relevant

Pic. 1. Deformation of base and shaft of the manhole made using rotational moulding method.



Pic. 2. Design pressure of ground waters on the bottom of the manholes

to the allowed load class on transport according to the Table 3".

Wavin, POLYPLASTIC, PipeLife, Nawell (PE), IKAPLAST manholes strictly comply with GOST 32972-2014.

There are possible GOST 32972-2014 compliance problems with the following manholes:

– Nawell (PP) – The use of PP for rotational moulding leads to the destruction of the material structure which influences stability at cone deformation.

– PK NIS – Manhole cone replacement using the welded design, made of horizontal sheet and a PE passage neck, directs all the vertical load onto the sheet and the manhole shaft, which leads to significant deformation and the destruction of the installation at class D loads – 100 kN and greater.

WEIGHT OF ROTATIONAL MOULDING MANHOLES

GOST 32972-2014 clause 5.1.8: "Weight of components made by rotational moulding must be within the following limits relating to the weight set in the manufacturer's technical documentation:

– for the components with weight less than 10 kg – over 96%;

– for the components with weight from 10 to 50 kg – over 97%;

– for the components with weight over 50 kg – over 98%".

Manufacturers' desire to save material can result in lower weight rotationally moulded manholes that could be different to the weight required by the technical specifications. In such cases, manhole deformation resistance will not comply with the regulations' requirements. Therefore, rotationally moulded manholes (Nawell, IKAPLAST) might require closer attention at the acceptance stage, especially if they are intended to be used in difficult conditions.

Conclusion

Wavin, POLYPLASTIC and PipeLife manholes (except for DN 1000 and DN 800 manholes) fully comply with GOST 32972-2014. IKAPLAST, Nawell and PK NIS manholes may not comply with some of them, due to their design features, and because of the production processes employed.

What does it mean for the actual use of manholes? These manholes may not display any problems in idyllic conditions (e.g. small depth, no ground waters, top quality installation with backfill etc.). But, in reality, as we know, the ideal conditions are quite rare; only full compliance with all the requirements can guarantee the reliable, long-term operation of plastic manholes.

PLANS IN THE PIPELINE: RADIUS SYSTEMS

Sourse: Energy, Oil & Gas Magazine, February 2016

In the face of a decade of challenging conditions in gas and water industries in the UK and worldwide, pipeline specialists have had to adapt and innovate in order to thrive in recent years. Radius Systems is a resilient UK provider with global reach that has clearly succeeded, thanks to its track record of innovation, breadth of products and services, and underlying financial stability. Today it is a key player within POLYPLASTIC Group, Europe's leader in thermoplastic compounds and the largest volume producer of polyethylene pipes and fittings.

Offering a full range of end-to-end capabilities is one way in which Radius Systems stands apart from others in a highly competitive market. Subsidiary company acquisitions have bolstered the Radius portfolio and today the company not only manufactures and installs new lines, it also offers a portfolio that includes specialist connectors, valves, commissioning services and rehabilitation solutions for line repair. Radius Systems CEO, Andy Taylor explains: "We look after the whole pipe life cycle: we can manufacture and supply all pipeline components, and install, repair and rehabilitate pipes all within one group of companies. This unique 'joined-up' approach gives us a competitive edge whereby we can look at a particular pipeline infrastructure project and provide a comprehensive offering."

Radius Systems has also succeeded in finding new ways to meet industry demands for more cost-effective solutions to complex problems. A prime example is the issue of aging infrastructure. Replacing underperforming pipelines can be prohibitively expensive however Radius offers an alternative solution that is cheaper and faster to deliver and meets modern safety guidelines. But saving money is not the only driver. As both the manufacturer and installer, Radius effectively cuts out a step in the supply chain and unlocks new benefits with its unique approach:

"Our understanding of both the products and the installation allows us to be innovative in both areas and to find the best value solution without some artificial barrier about where value sits in this area of the supply chain. That allows us to think differently, hence the idea around some of the off-site processing of the pipe being devolved to a factory environment before being delivered and installed. Equally as a large enterprise we have the resources to invest in this business area, covering the liner technology, related fittings and installation processes," explains Andy Taylor.

Innovation is part of the Radius Systems DNA. From the development of the first ProFuse peelable pipes drinking water and gas back in the late 90s to the recent rehabilitation of the legs of the Alpha Fortis oil rig using polyethylene pipe inserts: the company continues to break new ground across the utility, oil and energy industries.

One of the latest innovations to be launched is the recently developed 'Anaconda' system which is designed to resolve service connection issues in the gas market.

Andy Taylor says this new solution will make a real difference. "The fitting comprises an electrofusion tapping tee (or tapping saddle) with a factory welded flexible pipe on the outlet of the tapping tee. The flexible pipe can be bent to avoid obstacles within the trench, allowing for a connection to be effected when the position of the tapping tee is off-line with the service pipe. This removes the number of joints required within the system which in turn brings installation costs savings."

It is clear that gas utilities continue to seek material savings. Radius is well-placed to respond to the particular challenges facing this industry in the UK and Europe where vast swathes of old metal underground pipelines are in urgent need of repair or replacement. Radius subsidiary company, Subterra, specialises in polyethylene relining of existing steel pipelines and is a credible alternative to expensive new super duplex steel pipe systems. In a climate where cost is still very much a deciding factor, this is a solution that delivers better value outcomes too. Andy Taylor says this is exactly the kind of sensible thinking that Radius System is renowned for.

"We are challenging the use of super duplex stainless steel pipes as a default assumption. Value engineering the pipeline element by using systems such as PE liners in steel pipes is ideal for those searching for efficiencies when earnings are feeling the pinch and the outlook is for no major recovery in the near term."

From a long term perspective, Andy Taylor remains steadfastly positive. "Yes, the UK market for pipes has suffered in recent years as a reflection of the difficulties of the construction sector, delays in investment in the utilities and reduced expenditure on publicly funded projects. However, the longer term prospects are for a period of sustained growth with a re-start within the construction industry and significant infrastructure projects within the energy, transport, water and waste sectors."

The big picture is a positive one too. Although headquartered in the UK, Radius Systems has achieved significant global reach, supporting clients in Asia including Hong Kong and Singapore; Europe (East and West) including Russia, Germany, France, Latvia, Poland, Sweden and Czech Republic; Africa and the Middle East with clients in Egypt, Cameroon and UAE; as well as an active presence in Australia and New Zealand. As part of the company's ongoing global growth strategy, it will soon be opening a new WOFE (Wholly Owned Foreign Enterprise) in China to manage existing activities in the region as well as sourcing key components and products, identifying new core product manufacturing opportunities, and sales of pipe re-lining consumables.

With a period of sustained growth predicted, the future looks positive for Radius Systems as it continues to find the best possible solutions for its customers through innovation and acquisition. "The immediate priority for Radius is to consolidate and grow the new additions to our company. We will continue to look for new 'bolt-on' opportunities which add to our technology portfolio and give us wider geographical presence," Andy Taylor concludes.

USING HOME-PRODUCED MATERIALS FOR THE IN-HOUSE PE INSULATION OF STEEL PIPES

By A.A. Ioffe, S.G. Nizyev, A.I. Ekimov, E.V. Kalugina, M.L. Katsevman

Currently, high level of corrosion protection of main oil and gas pipelines is achieved by the combined application of modern insulating coatings and electrochemical protection. In-house applied coatings based on extruded PE have been widely used within the last few years.

The transition from bitumen mastic and film in-situ coatings to factory applied PE coatings of pipes allowed to increase the pipelines construction rate, eliminate the dependence of insulation works on weather conditions. Most importantly, as a result of extensive application of pipes with factory applied coating in construction of oil and gas pipelines, the quality and efficiency of corrosion protection has grown. Modern polymeric coatings can provide corrosion protection of pipelines for 40–50 years. Quality corrosion protection allows to significantly reduce the risks and emergencies, as external corrosion causes the most of emergencies of main pipelines.

There are two types of factory applied external PE coatings used in Russian Federation: two-layer PE coating and three-layer PE coating.

The two-layer PE coatings, consisting of adhesion sublayer based on hot-melt polymeric compound of 250–400 microns and outer PE layer of no less than 2 mm, are used as external protective coating for field pipelines, inter-settlement low-pressure gas pipelines and utility networks. They are practically not used abroad and they have been replaced by modern three-layer PE pipe coatings.

Three-layer PE coating is currently the most popular among all protective coatings applied in-situ or in-house. Unlike two-layer PE coatings, three-layer coating is not limited to pipe diameters and can be applied during construction of pipelines of any purpose.

The design of three-layer PE coating (pic. 1) is made of the following consequently applied PE layers:

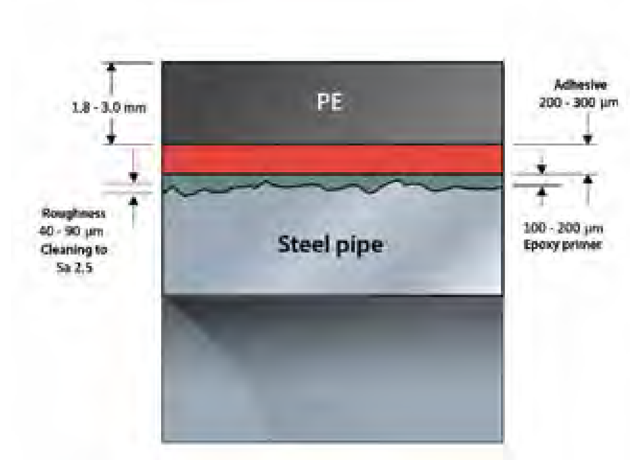
– epoxy primer layer (100–200 micron thickness for powdered epoxy paints and 50–100 microns for liquid epoxy paints);

– adhesive sublayer based on hot-melt polymeric compound (thickness of 200–300 microns);

– external PE layer (thickness of PE layer and the total thickness of coating depends on the pipe diameter, type of coating and, as a rule, changes from 2.0 to 3.5 mm).

The epoxy primer ensures coating resistance to cathodic disbonding, increased adhesion with steel as well as adhesion stability in the course of long-term operation, providing the basis for corrosion protection.

Adhesive polymeric sublayer is an intermediate transition layer between epoxy primer and PE layer. Its main function is to provide adhesion between outer PE and inner epoxy layers. Specially developed hot-melt polymeric compounds based on graft PE are used as adhesives. Such compounds have increased softening and melting points, high durability that allow to widen the temperature range for in-house coatings (up to +80°C) and significantly increase their adhesive properties.



Pic. 1. Design of three-layer PE coating

External PE layer having low moisture permeability acts as diffusion barrier and simultaneously provides high mechanical strength, impact resistance, puncture resistance, excellent dielectric properties.

The signature feature of three-layer PE coatings is the application of high-density PE compound for external extruded layer, that enhances all mechanical properties of the coating including tensile strength, impact resistance (in wide range of temperatures), puncture and cuts resistance. Enhanced mechanical properties of in-house applied three-layer coating ease transportation, long-term storage of insulated pipes, and range of construction works and pipeline installation.

Combination of three layers makes three-layer PE coating solid and one of the most effective protection coatings of pipelines.

Until recently all Russian companies mainly used imported insulating materials for three-layer PE coatings. Powder epoxy paints were supplied by 3M, BS Coatings, Akzo Nobel, Jotun Paints. Borealis AG, Basell Polyolefins, Total Petrochemicals, Arkema and a number of South Korean companies supplied adhesive composites and PE.

Despite the ever growing need in plastic materials for in-house PE pipe insulation there is an obvious deficit of home produced high quality advanced insulating materials. Home produced materials used for two-layer PE pipe insulation do not meet the modern technical requirements (industry regulation of Gazprom, AK Transneft) by a number of properties. Hence development and deployment of new plastic materials for in-house pipe insulation is an important matter of practical significance. It should be noted that the development of home produced materials for in-house pipe insulation has been intensified lately. Deployment of epoxy primers of producers like Yaroslavl Plant of Powder Paints and Pigment LLC of St. Petersburg has been successful as well as localisation of a number of foreign materials. Significant achievement has been reached in import substitution of adhesive and PE compounds for three-layer PE coatings by METACLAY CJSC, company of RUSNANO, which held about 20% share of PE coating market in 2014. POLYPLASTIC R&D Company has offered its own integral solution – Armobond composite adhesive and Torlen PEHD compound.

POLYPLASTIC together with Stavrolen started development of anticorrosion materials for pipelines in 2005. As a result of testing at production settings of Volzhskiy Pipe Plant, Moscow Pipe-Coating Plant and lab testing of VNIIST Institute, Lukoten F3802B pipe grade PEHD by Stavrolen was approved for use in three-layer PE coatings for pipes used in construction of main oil pipelines. Despite positive results of testing, the new PE composite found limited application in factory pipe coating. Deployment of the material was limited by its high viscosity, insufficient handling ability using transverse extrusion method and absence of home produced adhesive. Leading foreign companies offer complex solution to the pipe insulation industry – adhesive composite + PE composite.

Therefore, in 2012 POLYPLASTIC R&D Centre began research and development work to create own composite adhesive and PEHD for in-house PE pipe insulation similar to world's leading companies.

The following conditions were taken into consideration during materials development:

1. Technical characteristics and processability of materials must be competitive to their imported alternatives.
2. Basic insulating materials and PE coatings derived from them must comply with GOST R 52568-2006, Gazprom requirements (STO Gazprom 2-2.3-130-2007) and general specifications of Transneft (OTT.25.220.01-KTH-212-10).
3. Materials must be compatible with modern high-speed lines with the output of 3000 kg/hour.

The deployment of Armobond – Torlen anti-corrosion system started in 2013 [5]. The key feature of materials is the significant presence of home produced raw materials in composition.

To date, the following materials have been developed and passed technological and approval testing:

– Armobond PE-2K adhesive composite, TU 2243-122-11378612-2014;

– Torlen PE-2K-901 PE composite, TU 2243-123-11378612-2014.

Armobond PE-2K adhesive composite is a modified material based on LLDPE, has high processability, increased thermal stability and great mechanical properties.

Torlen PE-2K-901 PEHD composite has an optimal set of process and physical-mechanical properties as well as thermal stability. Armobond PE-2K system can be used for both two-layer and three-layer PE pipe coatings.

Technological tests of materials were carried out during batch production while coating application on big diameter pipes at Moscow Pipe-Coating Plant and Vyksa Steel Works. Coating application process was identical to the application of materials based on imported materials (application of Armobond at melt temperature range from 220 to 235°C, Torlen PE composite – from 230 to 245°C). This simplifies the transition between the coating systems and does not require readjustment of the equipment, which minimises possible additional costs.

Adhesion of the coating with steel in all cases was over 300 N/cm and cohesive peeling was observed during testing (pic. 2).

Currently there is a number of successfully passed testings

Pic. 2. Peel testing. Cohesive peeling of Armobond PE-2K

applied at MTZK OJSC, VMZ OJSC and a number of other enterprises with a combination of Resicoat R-726LD (AkzoNobel), PEP-0305 (NPK PK Pigment), PEP-0130 (YaZPK) epoxy primers. The quality of coating is approved by certificates of conformance of Transnet AK on all types of coatings of VNIIST OJSC, VMZ OJSC and approval of Gazprom VNIIGAZ.

Composition of Armobond adhesive and Torlen PE can replace their imported analogues, which helps import substitution of produce for main pipelines in a very important energy sector.

From the beginning of 2015 POLYPLASTIC R & D began serial production of Armobond and Torlen compounds and can commit to 20 thousand tonnes of produce per year, which will satisfy 25% of total demand from home enterprises in this type of material.

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GAS DIFFUSION IN HEAT INSULATED PLASTIC PIPE WITH INNER AND OUTER BARRIER LAYERS

By Evgeniy Devyatkin, Igor Gvozdev, Sergey Shalyapin

PU foam with a closed porosity structure is extensively used for heat insulation of pre-insulated plastic pipes. PU foams have good heat insulating properties due to low heat conductivity of gases trapped in the cells. One of the disadvantages of PU is its λ-ageing (deterioration of heat insulating properties over time) due to gradual substitution of gases with low heat conductivity into air components with higher heat conductivity [1–4]. Oxygen penetration into PU foam initiates its thermal oxidative degradation which can compromise the integrity of heat supply pipelines. Polymer barrier layers are used in order to slow down λ-ageing and oxygen diffusion. Calculations of changes in the gas concentration in the pores of PU foams of long pre-insulated plastic pipes with inner and outer diffusion barrier layers are of practical interest [4–6].

In general, analytical solutions for the dynamic problem of radial diffusion/ heat conductivity of three-layer pipes (pressure pipe, heat insulation, protective layer) are complicated [7–9] and very difficult to use for numeral evaluation. If outer and inner surfaces of heat insulation have barrier layers, the spatial distribution of diffusion gas concentration is almost uniform [5, 10] and concentration changes over time can be described by a simple equation (see below). Heat conductivity of systems with negligibly small inner thermal resistance is described in [11].

Diffusion equation for isotropic medium [12]

$$\frac{\partial C}{\partial t} = div(D\ gradC)\,, \quad (1)$$

C – gas concentration, t – time, D – diffusion coefficient. Equation (1) is true for materials where chemical reactions are complete and/or no dissociation of the gas in question is present. Otherwise, the first part of the equation must contain a gas source function.

Assuming that far from the ends of long non-corrugated heat-insulated pipe with inner and outer barrier layers, the distribution of gas concentration in the heat insulating layer is near to uniform and gas diffusion happens only in radial direction, after integration of the equation (1) upon volume of thermal insulating layer within the given length, we derive:

$$\frac{\partial \overline{C}}{\partial t} = \frac{S_e}{V_f}\left(D_f\frac{\partial C}{\partial r}\right)_{r=R_e} - \frac{S_i}{V_f}\left(D_f\frac{\partial C}{\partial r}\right)_{r=R_i}$$

$$\left(\frac{S_{i,e}}{V_f} = \frac{2R_{i,e}}{R_e^2 - R_i^2}\right). \quad (2)$$

where $\overline{C}$, D_f – respectively, the concentration averaged over volume and efficient gas diffusion coefficient in the insulation material, V_f, S_i, S_e – volume of insulation and squares of its inner and outer surfaces in the given length, R_i и R_e – inner and outer radiuses of heat insulating layer. If gas diffusion is determined by barrier layers and its concentration slightly differs from the average value $\left(|C-\overline{C}| \ll \overline{C}\right)$, then, omitting the influence of pressure pipe and protective jacket, we get the following for thin barrier layers:

$$\left(D_f\frac{\partial C}{\partial r}\right)_{r=R_i} = D_i\frac{\overline{C}-C_i}{e_i}\,, \qquad \left(D_f\frac{\partial C}{\partial r}\right)_{r=R_e} = -D_e\frac{\overline{C}-C_e}{e_e}$$

$$(e_i \ll R_i,\ e_e \ll R_e)\,, \quad (3)$$

where D_i, D_e – gas diffusion coefficients through the materials of inner and outer barrier layers, e_i, e_e – thicknesses of these layers, C_i, C_e – gas concentration inside the pressure pipe and in the air surrounding the protective layer. The integration of equation (3) into equation (2) gives:

$$\frac{d\overline{C}}{dt} = -\left(\frac{1}{\tau_i}+\frac{1}{\tau_e}\right)\overline{C} + \frac{C_i}{\tau_i} + \frac{C_e}{\tau_e}\,.$$

$$\left(\tau_{i,e} = \frac{V_f e_{i,e}}{S_{i,e}D_{i,e}}\right). \quad (4)$$

If $C_{i,e}$ and $D_{i,e}$ are the values that don't depend on time, the differential equation (4) solution in compliance with initial condition $\overline{C}(0) = C_0$, , can be recorded as:

$$\overline{C} = (C_0 - C_s)e^{-\frac{t}{\tau}} + C_s$$

$$\left(\tau = \frac{\tau_i\tau_e}{\tau_i+\tau_e},\quad C_s = \frac{\tau_i C_e + \tau_e C_i}{\tau_i+\tau_e}\right), \quad (5)$$

where τ – concentration change characteristic time, C_s – stationary concentration (marginal value $\overline{C}$ at $t \to \infty$, in the reality at $t >> \tau$). At $C_0 = C_s$ gas concentration in heat insulating layer remains constant $(\overline{C} = C_0 = const)$, as in this case at $C_i \neq C_e$ gas influx in PU foam through one barrier layer equals its deflux through the other. Equation (5) allows to calculate the average gas concentration value change in time in heat insulating layer made of PU foam between two barrier layers for different practical cases. For example, for the pipe in open air without heat medium we have $C_i = C_e = C_s$ (average mass content of basic gases in dry atmosphere is N_2 – 75,51%, O_2 – 23,14%, Ar

– 1,29%, CO_2 – 0,05% [13]). After determining concentration of the given gas in PU foam upon given time lapse of pipe storage at the warehouse, using equation (5), we can then use it as a starting value when calculating gas concentration during pipeline operation.

Diffusion coefficient of barrier layer materials can change in time due to materials ageing, impact of humidity and/or temperature change. If such changes in both layers during gas diffusion process can be described by the same time function $(D_{i,e} = D_{i0,e0} F(t)$, where D_{i0}, D_{e0} are constants), then it follows from equation (4) that the equation (5) is still valid if $D_{i,e}$ in the expressions for $\tau_{i,e}$ are replaced by the respective time-averaged values. At $C_i = C_e$ such replacement in equation (5) is true in case when the changes of diffusion coefficient values are described by different time functions $(D_{i,e} = D_{i,e}(t))$. Solution of differential equation (4) in quadratures can be written for the common case when diffusion coefficient of barrier layers materials and gas concentration inside and outside the pipe depend on time $(D_{i,e} = D_{i,e}(t),\ C_{i,e} = C_{i,e}(t))$.

The influence of pressure pipe and protective jacket on the radial gas diffusion in plastic pipes with heat insulation between barrier layers can be ignored when using following conditions:

$$\frac{e_p}{D_p} \ll \frac{e_i}{D_i}, \qquad \frac{e_c}{D_c} \ll \frac{e_e}{D_e}$$

$$(e_p \ll R_i,\ e_c \ll R_e). \quad (6)$$

where e_p, e_c – thicknesses, accordingly, of pressure pipe wall and protective jacket (usually $e_{i,e} << e_{p,c}$), D_p, D_c – their diffusion coefficients. Spatial distribution of the gas in the PU foam layer is near to uniform if the following condition is followed:

$$\frac{e_f}{D_f} \ll \frac{e_{i,e}}{D_{i,e}},$$

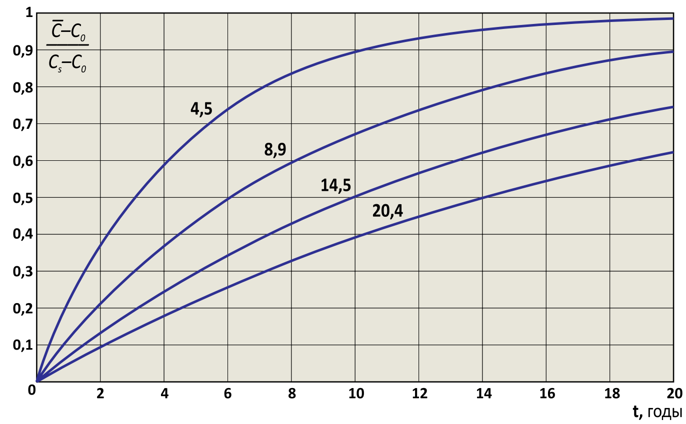
where e_f – thickness of the heat insulation layer. Temporal variation of gas concentration averaged over a volume of thermal insulation layer in such pipes is described by equation (5), and concentration changes in the thickness of the pressure pipe ΔC_p and of the jacket ΔC_c are low and equal

$$\Delta C_{p,c} = |\bar{C} - C_{i,e}| e_{p,c} D_{i,e} / (e_{i,e} D_{p,c}).$$

For example, let's calculate the characteristic time of oxygen concentration change in PU foam for the pipes stored at the warehouse with relatively high diffusion coefficient value through the barrier layers $D_i = D_e = 7 \cdot 10^{-16}$ m²/s and thicknesses of barrier layers $e_i = 0{,}1$ mm и $e_e = 0{,}01$ mm. Then, e.g., for the pipes with sizes 32/63, 75/125, 140/225, 160/270 (V_f/S_i = 19, 32, 50, 82 mm, V_f/S_e = 10, 20, 32 and 45 mm accordingly) we get $\tau \approx \tau_e$ = 4,5, 8,9, 14,5 and 20,4 years ($\tau_i >> \tau_e$). Graphs of normalised concentration value changes in time

$$(\bar{C} - C_0)/(C_s - C_0) \approx 1 - exp(-t/\tau_e)$$

(here $C_s = C_i = C_e$ и $C_0 < C_s$) for these values τ_e are shown on the picture.



Increase of the normalised oxygen concentration in the PU foam in time for the pipe sizes 32/63, 75/125, 140/225, 160/270 with barrier layers of various thickness e_i = 0.1 mm, e_e = 0.01 mm and the same diffusion coefficient $D_i = D_e$ = 7·10¹⁶ m²/s (values $\tau \approx \tau_e$ = 4.5, 8.9, 14.5 and 20.4 years correspond to relations values V_f/S_e = 10, 20, 32 and 45 mm).

In the given situation of relatively high permeability of the barrier layers and thin jacket characteristic time of oxygen concentration increase in PU foam for the pipes with a small relation V_f/S_e is not great, and after storing them for several years there will be significant increase of concentration (time of the normalised value increase up to half of the maximum is $t = 0{,}69\tau$).

To maintain the initial concentration, we obviously need to increase the thickness of the outer barrier layer for such pipes and/or use barrier films with lower oxygen permeability coefficient. The thickness increase of the outer barrier layer to the thickness of the inner layer $e_i = e_e = 0{,}1$ mm for the pipes with V_f/S_i = 19 mm, V_f/S_e = 10 mm will give τ_e = 45.3 years and, considering τ_i = 86.1 years, we get τ = 29.7 years. The above shown diffusion coefficient matches type G of EVAL™ gas barrier films (48% of ethylene) at 20°C and relative humidity of 65%, having the highest oxygen permeability out of grades presented in [14]. The type L films (27% of ethylene) oxygen permeability at the same conditions is 15 times lower and corresponding value of τ_e for the same pipe in the earlier given example (e_i = 0.1 mm, e_e = 0.01 mm) exceeds 68 years.

Equation (5) is true in more general cases when conditions (6) are not fulfilled and there is a need to include the influence of pressure pipe and protective jacket. In these cases, we have to change τ_i and τ_e in this solution, accordingly, to $\tau_i + \tau_p$ и $\tau_e + \tau_c$, where $\tau_{p,c} \approx V_{f\,ep,c}/(S_{i,e} D_{p,c})$ (we assume that $e_i << e_p << R_i$, $e_e << e_c << R_e$). Gas concentration change values in these layers equal

$$\Delta C_{p,c} = |\overline{C} - C_{i,e}|/(1 + \tau_{i,e}/\tau_{p,c})$$

(the influence of adhesion layers to diffusion process in reinforced plastic pipes can be counted using the similar method). In quasi-stationary mode at $\overline{C} \approx C_s$ for the concentration change in the pressure pipe wall we get

$$\Delta Cp \approx | C_e - C_i | \tau_p /(\tau_i + \tau_p + \tau_e + \tau_c).$$

This equation shows that at low oxygen concentration inside the pressure pipe ($C_i << C_e$) and $\tau_{i,e} >> \tau_{p,c}$ maximal concentration on its outer surface $\Delta C_p \approx C_e \tau_p /(\tau_i + \tau_e)$ is much lower than the concentration on the outer surface of the protective jacket. For the heat insulated metal pipes with outer barrier layer we have $\tau = \tau_e$, $C_s = C_e$ ($\tau_p \to \infty$ at $D_p \to 0$), and solution (5) in this case is the same as the solution for vapour partial pressure from [10]. The given method for calculation of gas concentration in PU foam heat insulation of plastic pipes with barrier layers can be used to determine their shelf life when initial and marginal conditions are known and for calculation of concentration at pipeline operation.

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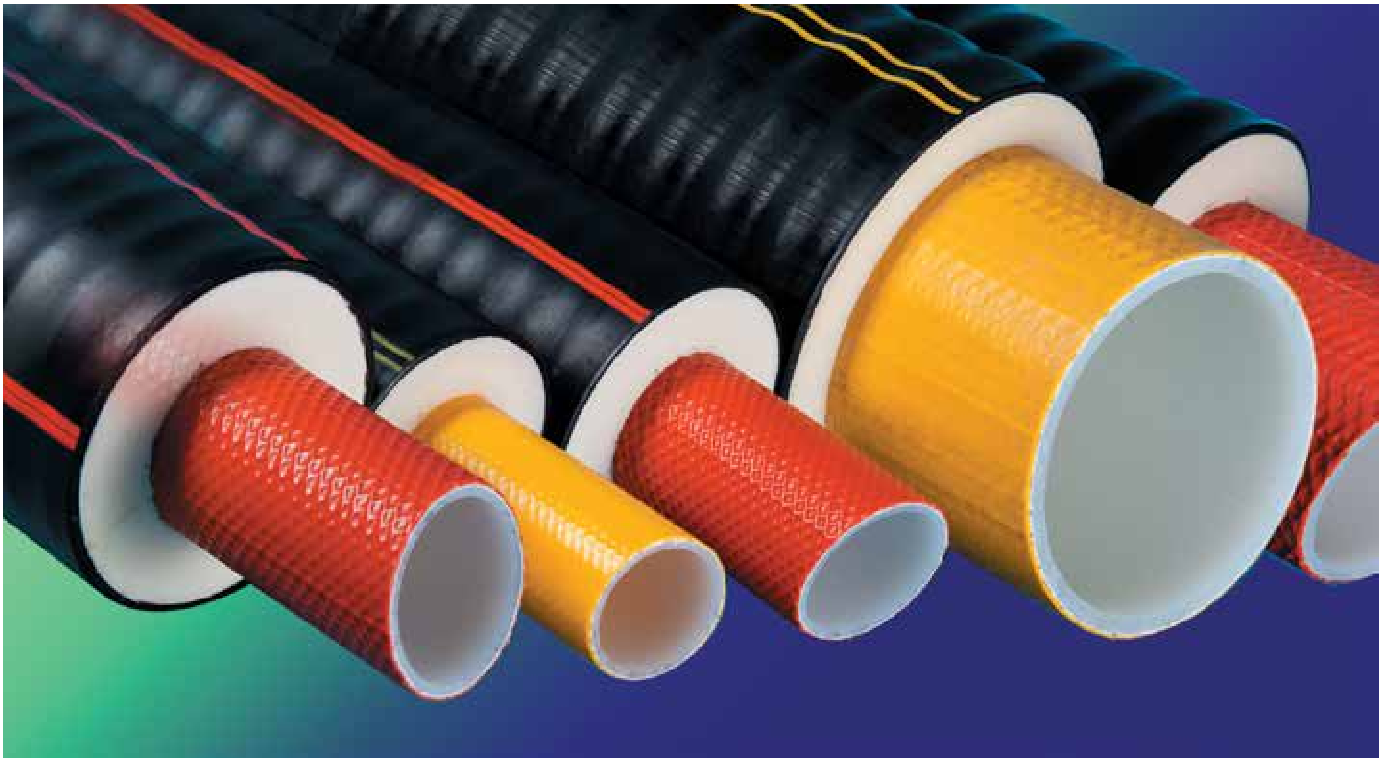


A COMPARATIVE ANALYSIS OF ALTERNATIVE METHODS OF HYDRAULIC CALCULATIONS OF PLASTIC SEWER PIPELINES

By Ilya Averkeev

The design of external sewer network pipelines cannot be assessed without a sound understanding of the hydraulic calculation for the pipeline network. The purpose of the calculation is to determine the inner diameter of the pipelines that will provide a required flow capacity, and guarantee the required hydraulic parameters for wastewater flow, at both pressure and non-pressure operating modes.

The Russian method for the design of gravity pipelines uses Lukinyh tables to help determine pipe sizes to provide optimal hydraulic characteristics. These tables are calculated using the formula of Academic N.N. Pavlovskiy for Chézy coefficient determination suggested in 1925 [3]:

$$C = \frac{1}{n}R^{y}$$

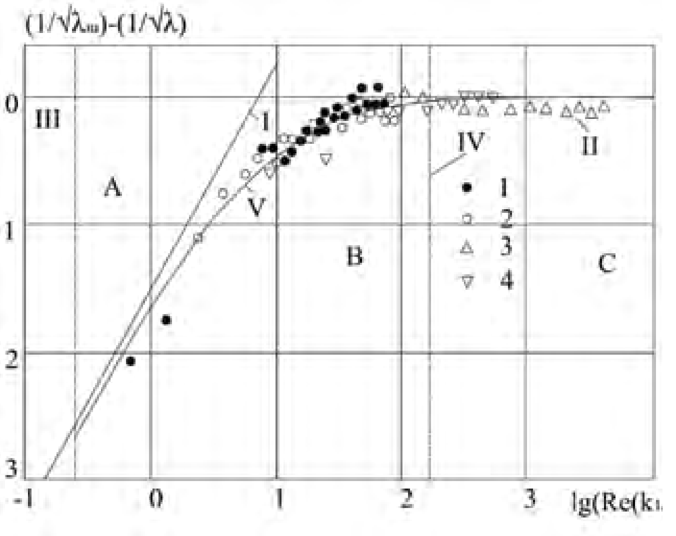
where

$$y = 2{,}5\sqrt{n} - 0{,}13 - 0{,}75\sqrt{R}\left(\sqrt{n} - 0{,}1\right),$$

where

R – hydraulic radius, m;
n – dimensionless roughness coefficient characterising the inner surface of the pipeline wall, specific only to the Pavlovskiy formula.

It is a precise and effective formula, supported by the practice of domestic hydrotechnical construction. It should be noted that this formula is true for the area of quite rough friction, or otherwise, in quadratic realm of hydraulic resistances [2]. Research data obtained as a result of hydraulic experiments in the laboratory of the Moscow Institute of Civil Construction Engineers (presently NIU MGSU), show that the main area of service pipeline operation is the mixed friction zone, where head loss value (and other hydraulic indicators) depends on both roughness of the inner surface of the pipe wall and the water viscosity [1]. Based on the results of Murin, Friman (pic. 1) and NII VODGEO, we can assume that implication of relationships describing head loss without water viscosity consideration is true in case of calculations for old and cast iron pipelines (i.e. pipes with high inner wall roughness value) [1]. The operational conditions of new steel, brass, glass pipes (i.e. pipes with extremely low roughness) refer to the mix friction zone [1].



Pic. 1. Experimental data and analytically obtained dependence of hydraulic friction coefficient from the Reynolds number.

A – area of hydraulically smooth pipes, B – mixed friction area, C – area of rough friction; I – the line of hydraulically smooth pipes, II – the line of rough pipes, III – the border of hydraulically smooth pipes area, IV – the borders of rough pipes area, V – analytically obtained dependency.

Points description: 1 – Murin's experiments on new steel pipes, d = 74 mm, 2 – same at d = 105.1 mm, 3 – Friman's experiments on old steel pipes d = 100 mm, 4 – same at d = 50 mm.

The design of sewer and water networks made of pipes with knowingly rough surfaces is carried out using formulas not considering head loss as a result of liquid viscosity. Therefore, the use of Lukihyh tables can be considered as correct for cast iron, concrete and asbestos cement pipes. However, the simple implementation of this calculation method for pipes made of plastic materials is not allowed given the extremely low roughness of the inner pipe surface, which remains consistently smooth during operation. Pipes made of plastic materials will operate in mixed friction zones. This is confirmed by the results of the experiments described above, as well as from the perspective of analytical dependencies used for polymer pipelines.

Then, Reynolds number, that corresponds the quadratic realm with hydraulic resistances of liquid turbulent flow, can be determined using the following formula [1]:

$$Re_{кв} = \frac{500 \cdot 4R}{K_э}$$

where actual Reynolds number:

$$Re_ф = \frac{V \cdot 4R}{\nu}$$

where:

$K_э$ – equivalent roughness coefficient; we use 0,0136 mm (this value is obtained based on the series of experiments on the PE100 pipeline, outer diameter 110 mm on the special hydraulic stand in the lab of Vodosnabzhenie, NIU MGSU [4]);

V – average water flow velocity, m/s;

R – hydraulic radius, m;

ν – kinematic water viscosity coefficient , m²/s.

Considering the ratio of $Re_{кв}$ to $Re_ф$ and specifying such conditions of the pipeline operation where quadratic realm of hydraulic resistances will appear with significant probability.

Then we get:

$$\frac{Re_{кв}}{Re_ф} = \frac{500 \cdot \nu}{K_э \cdot V}$$

where:

V = 10 m/s – maximal velocity in storm water sewer made of plastic pipes (for domestic sewage systems V = 8 m/s) [6];

ν = 0,475 · 10^{-6} m²/s – kinematic water viscosity at 60°C (as a maximum acceptable temperature for external pipe networks made of plastic pipes [7]). It should be noted that it is recommended for domestic sewage ν = 1,49 · 10^{-6} m²/s [7].

Then we get:

$$\frac{Re_{кв}}{Re_ф} = \frac{500 \cdot \nu}{K_э \cdot V} = \frac{500 \cdot 0{,}475 \cdot 10^{-6}}{0{,}0000136 \cdot 10} = 1{,}75$$

Therefore: $\frac{Re_{кв}}{Re_ф} > 1$ or otherwise: $Re_{кв} > Re_ф$

The present inequality means that the actual operating mode of plastic pipelines (even in cases closest to the area of quite rough friction) will still be in the area of mixed friction. So we need to consider the influence of water viscosity on the hydraulic parameters of pipelines.

The German ATV-DVWK-A 110E standard (the source of extra information according to DIN EN 752, part 4, chapter 4, and, therefore part of the European standard) uses Kolbruk's formula [8] to determine the hydraulic resistance of a gravity disposal pipeline or channel:

$$\frac{1}{\sqrt{\lambda}} = -2 \cdot \lg\left[\frac{2{,}51}{Re \cdot \sqrt{\lambda}} + \frac{1}{3{,}71} \cdot \frac{k_э}{4R}\right]$$

where λ – hydraulic resistance coefficient of the gravity pipeline (channel) with hydraulic radius equaling R.

It is also noted that only this equation has a practical significance for calculation for pipelines and water disposal channels [8].

The flow capacity of the gravity channel is determined using the following formula [8]:

$$Q = A \cdot \left\{-2 \cdot \lg\left[\frac{2{,}51 \cdot \nu}{4R \cdot \sqrt{2g \cdot 4R \cdot J_E}} + \frac{k_э}{14{,}84 \cdot R}\right] \cdot \sqrt{2g \cdot d \cdot J_E}\right\}$$

where:

A – flow section of disposal water, m²;

J_E – energy gradient, determined as relation of head loss (energy) h_f, m, on the friction in the pipeline to its length l, m [8]:

$$J_E = \frac{h_f}{l}$$

Kolbruk's formula is considered reliable and based on experimental data, including water viscosity and possibilities of pipelines operation in mixed friction.

However, in A.D. Altshul's works (based on the experimental data of Powel, Warwick and other scientists), it notes that the resistance of gravity pipes and canals in most cases, is completely different from the resistance of round pressure pipes with the same Reynolds number and roughness of the inner pipe wall. Consequently, Altshul insists it is not possible to use the formulae normally recommended for round pressure pipes, for calculations of movement in gravity pipelines and canals [1]. Also, in support of inaccuracy of the calculations for gravity pipes and canals using formulae for pressure pipes, Altshul brings comparison of dependancies to determine Chézy coefficient, derived:

– from recalculations using Kolbruk's formula [1]:

$$C = 17{,}72 \cdot \lg\frac{R}{\varepsilon_1 + \frac{0{,}223 \cdot \nu}{\sqrt{gRi}}}$$

– using generalised formula for hydraulic calculations for open canals and non-pressure pipes, which would consider the influence of inner pipe wall (canal) roughness and liquid viscosity as well as turbulent flow in the pipe (canal) as a whole unit (without segregation for turbulent core and laminar sub-layer) [1]:

$$C = 20 \cdot \lg\frac{R}{\varepsilon + \frac{0{,}385 \cdot \nu}{\sqrt{gRi}}}$$

where ε and ε_1 – specific linear roughness, m. Where ε is linked with average height of roughness peaks k, and ε_1 is linked with the coefficient equal equigranular roughness $k_э$.

Altshul notes that both formulae have similar structures, but the formula derived from the recalculation of the formula for pressure pipes (Kolbruk's formula) has other values of constants which will lead to inaccuracies in calculations [1].

Therefore, it could be concluded that calculation according to the ATV-DVWK-A 110E standard for drainage water pipelines and canals will have insufficient accuracy due to its primary orientation of the formulae for pressure water flow in round pipes.

Dobromyslov's approach to determining the hydraulic parameters of gravity water drainage pipe differs from the above-mentioned methods. In his analysis of behaviour of steady set water flow in gravity drainage pipelines, Dobromyslov (based on the Pavlovskiy and Darcy-Weisbach formulae) obtains velocity distribution in a cross-section of non-pressure flow for all areas of turbulent water flow including areas of mixed friction

$$\left(\frac{V_н}{V_п}\right)^b = \left(\frac{R_н}{R_п}\right)^{1+a}$$

where:
$V_н$ and $V_п$ – water flow velocity at partial and complete filling of the pipeline;
$R_н$ and $R_п$ – hydraulic radius at partial and complete filling of the pipeline;
$\alpha = 0{,}3124\ K_э^{0{,}0516}$;
b – indicator of water flow condition (1 – laminar condition; from 1 to 2 – turbulent condition, area of mixed friction; >2 – turbulent condition, quadratic realm of resistance).
In case of full pipeline filling, based on extended analysis and experimental research, Dobromyslov suggests the following dependance for $b_п$ determination [2]:

$$b_{\text{п}} = 3 - \frac{\log Re_{\text{кв}}}{\log Re_{\text{ф}}}$$

It should be noted, that Dobromyslov in his approach suggests disregarding the variety of characteristics of the quality of the inner pipe wall (roughness coefficient), which for gravity pipelines have their own specific value and legend depending on the formula used. Further, he suggests taking a uniform coefficient of equigranular roughness $k_э$ with linear size (mm), which was regularly used in practice for hydraulic calculations for pressure pipes and comes with relevant and proven values for pipes made of different materials [2]. This coefficient obtained for pressure pipelines made of given material (e.g. PE 100) can be successfully used for hydraulic calculations of gravity pipelines made of the same material.

According to Dobromyslov, water flow velocity at full capacity, considering the possible operation of the pipeline in non-quadratic areas of resistance is determined based on the Darcy-Weisbach formula:

$$V^b{}_{\text{п}} = \frac{i \cdot 2g \cdot 4R_{\text{п}}}{\lambda_{\text{п}}}$$

and coefficient of hydraulic resistance $\lambda_п$ at full filling of the pipeline as

$$\lambda_{\text{п}} = 0{,}2\left(\frac{K_{\text{э}}}{4R_{\text{п}}}\right)^{\alpha}$$

Therefore, after obtaining water flow velocity in the full pipeline, as described by Dobromyslov's law of velocity distribution in the cross-section of non-pressure flow, water flow velocity in a gravity pipeline can be obtained at any filling (gravity pipeline flow capacity):

$$q_н = V_н \cdot \omega\ ,$$

where ω – live cross-section of liquid flow at given filling of the pipeline, m^2

After calculating using the formulae based on the Dobromyslov method, the table of hydraulic characteristics for specific sizes of gravity pipeline built at a certain inclination can be calculated. Dobromyslov made up his tables for hydraulic calculations for non-pressure pipelines made of plastic materials, based on this method,

We do need to bear in mind that in his tables (for both gravity and pressure pipelines) Dobromyslov refers to the old classification of pipelines made of plastic materials. It is necessary to compare the inner diameter of the pipe in question with the inner pipe diameters in Dobromyslov's Hydraulic calculation tables, due to the modern trend for creating new pipe types made of plastic materials (e.g. plastic pipes with structured walls for external sewerage systems).

It should also be noted that pressure pipelines made of PE now have updated tables for hydraulic calculations based on the Dobromyslov method and written by O.Prodous, containing an SDR pipes classification. Unfortunately, there are no similar tables for gravity pipelines, although it would not be a problem for a skilled designer or engineer to create a simple programme for making a hydraulic table based on the Dobromyslov method for certain brands and types of gravity plastic pipelines.

Conclusions:

1. The most relevant and most frequently applied practices of hydraulic analysis of water disposal pipelines and hydraulic calculations of sewer pipes have been considered.
2. It has been proved experimentally and analytically that the tables for the Lukinyh hydraulic calculations for gravity pipelines, based on the Pavlovskiy formula for Chezy coefficient, cannot ensure exact data for hydraulic characteristics for non-pressure plastic pipelines due to the absence of the liquid viscosity influence on hydraulic parameters of pipeline operation in this formula.
3. It is proved that Kolbruk's formula for pressure pipelines (that makes the basis for hydraulic calculations in ATV-DVWK-A 110E Standard) insufficiently describes the hydraulic parameters of gravity pipelines and canals.
4. It is noted that Dobromyslov's method of hydraulic calculation for gravity pipelines (based on the velocity distribution in the cross-section) includes a well-studied and universal coefficient of equigranular roughness, which is able to precisely determine the hydraulic parameters of the non-pressure pipeline taking into consideration its operation in mixed friction areas.

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THE INFLUENCE OF COMPRESSION FITTINGS ON TOTAL HEAD LOSS IN ISOPROFLEX 115-A PIPELINE SYSTEMS

By Ruslan Miranovich, Sergey Tsarev, Ilya Averkeev

Introduction

The rapid development of production technology for plastic pipeline systems has widen their potential applications to other areas such as heating networks. Expanding the range of ISOPROFLEX plastic pipelines is the next step towards enhancing operating parameters. ISOPROFLEX-115A flexible heat insulated pipes are designed for wide range of operating temperatures up to 115°C and pressures to 1.25 MPa.

Adopting greater operational parameters meant that a review of the traditional ways in which fittings are installed was required. This led to the creation of a completely new design for connecting joints and a toughening the requirements for installation methods and technology. A new type of connecting component was developed for ISOPROFLEX-115A, press fittings with a plastic ferrule (pic. 1).

Pic. 1. Press fitting components and ISOPROFLEX-115A plastic ferrule

The major difference with this design is that there is no need for mechanical expansion of the pipe end during installation. Such technology helps to avoid the destructive impact of the hydraulic expander which can cause damage the structure of the reinforcing fibres in the pressure pipe and result in reduced durability and operational properties.

The inner geometry of the press fitting with plastic ferrule is designed to minimise hydraulic losses within the pipeline system. This research evaluates hydraulic losses in a pipeline system caused by the connecting components (press fittings) and their impact on the total head loss of the system.

Object of the research

The subject of the research is a section of the pipeline system consisting of ISOPROFLEX-115A flexible plastic pipe (with pressure pipe G-PEX-115-AMT) (hereinafter referred to as PIPE) and two press fittings with a plastic ferrule on both ends of the pipe.

The main supposition we used while doing this task is that the pipe placed on ideally straight surface without inclinations. In real conditions it is practically impossible to achieve this, but in this case let's omit the additional hydraulic losses.

Calculations were done for the whole range of ISOPROFLEX-115A pipes with outer diameters of the pressure pipes from 50 to 160 mm.

Methods and approaches

The theoretical calculations based on the method described in specialised literature were used to solve the problem [1–3].

Specific energy loss (head loss), that is used to overcome the heat transfer agent resistance (hydraulic resistance), is combined from two types of losses:

1) head loss to overcome hydraulic resistance by length, proportionate to the length of pipe sections, where agent is moving – loss by length $h_{дл}$;

2) head loss to overcome hydraulic resistance within the short sections near to local design components of the pipeline – local head loss $h_{м}$.

Total head loss equals the sum of loss by length of separate sections and all local head losses:

$$h_{тр} = \Sigma h_{дл} + \Sigma h_{м}$$

The study shows that the value of the head loss by length $h_{дл}$ is directly proportional to the length of the pipe section where these losses are calculated, and depends on the inner cross-section of the pipeline and the agent movement modes:

$$h_{дл} = f(L, V, d, K_э)$$

where L – length of pipe section, m;
V – velocity of the agent, m/s;
d – diameter of the inner cross-section of the pipeline, m;
$K_э$ – equivalent roughness coefficient, m.

For the pipes of PEX $K_э$ = 0,0000136 m (the value is achieved after experiments in the lab).

The calculations of local resistance reduces to head loss calculation at the presence of end connection components. Pic. 2 shows the design of a press fitting with a plastic ferrule. Further during the course of the study we will use the 'fitting' definition with as the reference to the coupling with the pipe end for welding (pos. 1). The inner geometry of the fitting can be referred to as the confuser-diffuser [3]. Therefore, the coefficient of hydraulic resistance of the fitting is:

$$\zeta = \zeta_{конф} + \zeta_{диф}$$

where $\zeta_{конф}$ – coefficient of hydraulic resistance of the conf user;

$\zeta_{диф}$ – coefficient of hydraulic resistance of the diffuser.

$$\zeta_{конф} = \frac{\lambda_T}{8 \cdot \sin(\alpha/2)} \cdot \left(1 - \frac{1}{n_c^2}\right)$$

where $\alpha/2$ – conjunction angle of the cone and cylinder surfaces;
n_c – degree of confuser narrowing.

$$\zeta_{диф} = \frac{\lambda_T}{8 \cdot \sin\left(\beta/2\right)} \cdot \left(1 - \frac{1}{n_p^2}\right) + k \cdot \left(1 - \frac{1}{n_p}\right)^2$$

where $\beta/2$ – conjunction angle of the cone and cylinder surfaces;
n_p – degree of diffuser expansion;
k – softening coefficient; $k = \sin \alpha$ (at 5° ≤ α ≤ 20°).

The total head loss near the fittings on the given pipeline section can be calculated using the following formula:

$$h_м = \sum \zeta \cdot \frac{V^2}{2 \cdot g}$$

where
V – velocity of the liquid, m/s;
g – gravity acceleration, m/s^2.

Pic. 2. Compression fitting design.
1 – insert with pipe joint for welding; 2 – plastic ferrule; 3 – sliding sleeve; 4 – pressure pipe

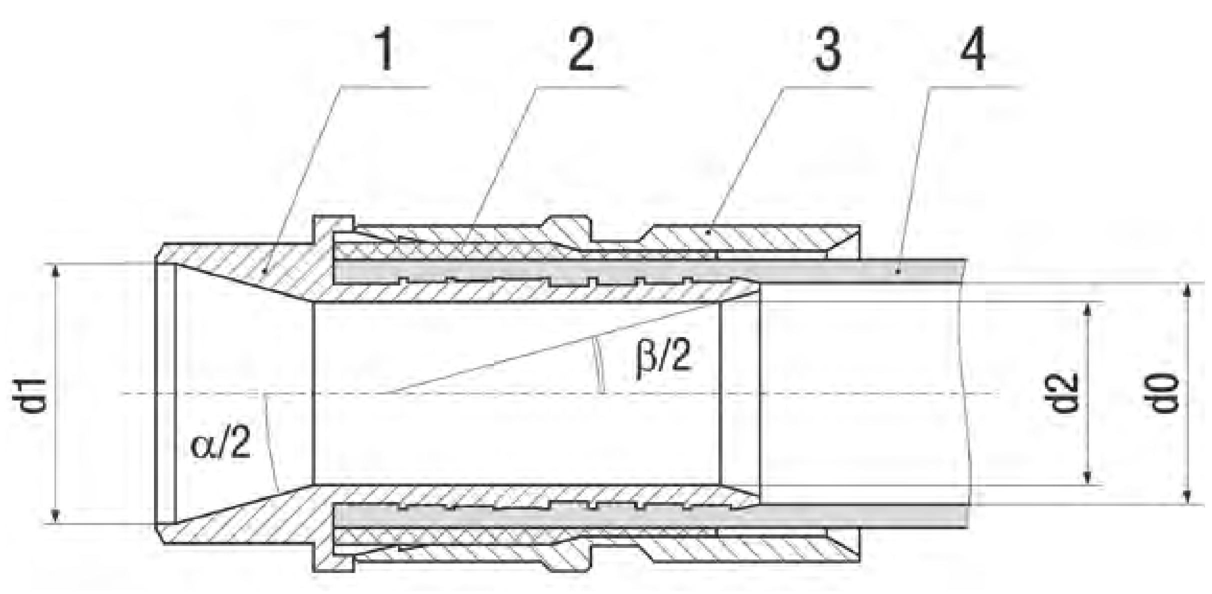


Table 1. $L_{экв}$ **coefficient for different pipe sizes at different flow rate**

Temperature of heat medium, T, °C	Flow rate, V, m/s	Pipe sizes							
		50	63	75	90	110	125	140	160
60	0,3	0,56	0,54	0,76	0,88	1,04	1,07	1,04	1,31
	1,5	0,72	0,76	1,06	1,22	1,43	1,47	1,42	1,79
	3,0	0,78	0,75	1,05	1,21	1,42	1,46	1,41	1,78

Results

As seen above, the level of hydraulic loss at fittings depends on the inner cross-section of the pipeline and the velocity of the heat-transfer agent. To simplify the data after the calculations, we input a special value equivalent $L_{экв}$ – ratio of local losses on a pair of fittings to head loss at one lean metre of a pressure pipe:

$$L_{экв} = \frac{h_1}{h_2}$$

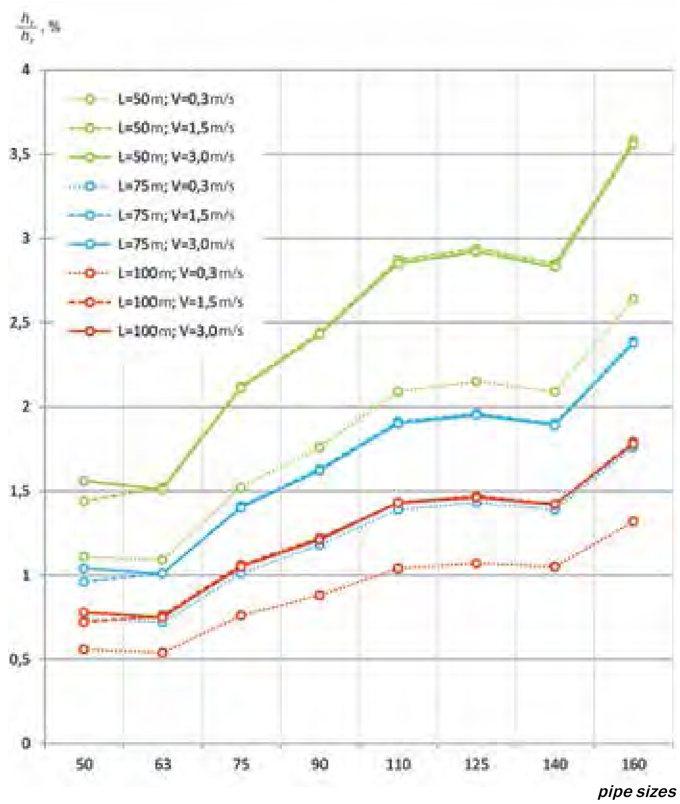
where h_1 – head loss at fittings, m;
h_2 – head loss on one lean metre of the pipe; h_2 – is a dimensionless value.

Physical meaning: $L_{экв}$ coefficient shows how random pipe increases on the given pipe section after adding two fittings to the system. The value of $L_{экв}$ is shown in Table 1 for different pipe sizes and various liquid velocity.

The above calculations have helped to determine that head loss at the press fittings of the ISOPROFLEX-115A pipeline system is in the range of heat transfer medium velocity 0.2–3.0 m/s do not exceed the value equivalent the head loss at the section of the pressure pipe of 0.7–1.8 metre (depending on the pipe size).

The local loss on the pair of the pipe end press fittings relating to the total hydraulic loss of the section decreases (from 1.6–3.7% on the 50 metres section to 1.8–1.8% on the 100 metres section) if the length of the given pipeline section increases.

Therefore, hydraulic head loss, caused by forced narrowing of the inner cross-section of the pipeline at the places of installation of the fittings is negligibly small when crating long sections of the pipeline.



Pic. 3. Head loss at fitting $h_ф$ **to head loss at pressure pipe** $h_т$ **ratio.**

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ASSESSING THE TRUE QUALITY OF DOUBLE WALL CORRUGATED PIPES

Lately, there has been a lot of controversy about the quality of the two-layer plastic corrugated pipes available on the Russian market, and about their evaluation criteria. In response, POLYPLASTIC Group would like to make its position clear.

1. First of all, let us consider the indicators and technical specifications, in accordance with GOST R 54475-2011: "Plastic structured-wall pipes and their fittings for sewerage systems outside the buildings". Some of the key specifications need explaining. Corrugated pipes can be produced from both PE and PP. Each material has its advantages and disadvantages: PE has better impact resistance, especially at low temperatures, whereas PP is more resistant to high temperatures. Unfortunately, some domestically-produced types of PP don't always make pipes with a high impact resistance.

2. GOST R 54475-2011 stipulates two ways of testing for impact resistance: at 0°C (clause 8.6) and at –10°C (Annex A, compulsory). On that basis, a producer can carry out tests using one of these methods, ensuring higher or lower impact resistance at low temperatures. The customer needs to consider that, if the storage, transportation and installation of the pipes is conducted at low temperatures, then they will need to choose their pipes using Annex A of GOST R 54475-2011 (the testing method must be indicated in the pipe specification).

All divisions of POLYPLASTIC Group carry out impact resistance tests on CORSYS and CORSYS PRO pipes according to Annex A of GOST R 54475-2011 at –10°C.

3. Arguments about the differences in the resistance of PE and PP to external loads have no technical grounds. If pipes comply with GOST R 54475-2011, their high deformation during operation can be caused by two reasons: as a result of improper design (the wrong choice of SN), and/or a breach of installation technology, in particular, the sequence of backfill stipulated in the construction regulations.

Pipe resistance to load is characterised by ring stiffness and ring flexibility. Ring stiffness is calculated upon 3% pipe deformation as a result of testing (clause 8.4, GOST R 54475-2011). PP is stiffer compared with PE (flex modulus 1450 and 950 MPa accordingly) and provides a lower profile which is more lightweight and more economically viable for the manufacturer. On the other hand, PE pipes with the same stiffness type have thicker walls ensuring guaranteed extra ring flexibility – an ability to maintain integrity and structure at up to 30% pipe deformation (clause 8.5, GOST R 54475-2011), which provides extra reliability.

POLYPLASTIC Group specialists are available to help customers select pipes during the design phase, and to provide necessary consultations on the installation of plastic pipelines for construction companies.

4. Practically all corrugated pipes in the market are supplied with socket-and-spigot joints. GOST R 54475-2011 allows the use of sockets made by different technologies – in-line moulding and injection moulding with consequent welding to the pipe.

An in-line moulded socket is made directly during the pipe extrusion process. Due to some specifics of technology, in most cases, it has less mechanical resistance, resulting in insufficient structural stiffness at bends, or pipe deformation. Moreover, in-line moulding does not guarantee fine tolerance at the inner diameter of the pipe's end which often leads to loss of tightness on the joint.

The reduced stiffness of in-line moulded sockets is often the reason behind their deformation during storage and transportation. In the best case scenario it complicates installation of the pipes, but in the worst case, it reduces reliability and compromises the integrity of the joint.

Leading European producers of corrugated pipes, including the POLYPLASTIC Group are now only using strictly welded socket technology. The sockets are made by injection moulding, the technology provides high size precision with fine tolerance, and higher integrity owing to strengthening ribs.

Welding is done in-house, automatically, which ensures total compliance of the technology, minimises the possibility of human error, and guarantees the high quality and integrity of all joints. The quality of welding of CORSYS and CORSYS PRO pipes is checked using the destruction method on each batch.

It should be noted that GOST R 54475-2011 does not stipulate any requirements for the ring stiffness of sockets. The arguments of some producers that their sockets have the same ring stiffness as the pipes – up to 16 kN/m^2 – are incorrect, simply because the production of such sockets is technically and economically unnecessary. The integrity and reliability of the joint is not determined by the higher ring stiffness of the socket, but by its geometrical parameters and material specifications.

The POLYPLASTIC Group recommends designers and customers consider all of this information, and ask pipe suppliers to provide lab test results according to GOST R 54475-2011, as well as any certificates. This will ensure the superior quality of any pipes used for the construction of non-pressure pipelines systems.

Vilnis Puce

Strategic marketing and innovation development Director of pipe division, POLYPLASTIC Group

RUSSIAN FITTINGS OF ENGLISH ORIGIN: NEW PRODUCTION IN KLIMOVSK

By Elena Volkova,
POLYPLASTIC Group

Radius electrofusion fittings entered the Russian market in autumn 2013. The product range included fittings up to 315 mm, tees and elbows up to 180 mm and reducers up to 250 mm. From 2014 the range was increased with the addition of 355 mm and 400 mm fittings. Radius Systems also began producing 40V fittings specifically for Russian consumers, in addition to the traditional 80V rating.

These products are marketed as 'economy class fittings' alongside the premium Georg Fischer fittings offered by POLYPLASTIC Group. The crisis revealed the timeliness of this offering as sales of Radius fittings on the Russian market today are now over 300,000 units.

The fittings packing system was set up specifically for the Russian market. In Britain, the finished products are packed in an individual plastic bag and stored in boxes on pallets. They are only placed in cardboard boxes in the ordered quality just before shipping to the customer. The average distance from the Radius Systems warehouse to the British consumer is no greater than 300 km, however for customer deliveries to Russia, the distance covered is at least 3200 km. If the additional logistics required to reach POLYPLASTIC's regional warehouses in Omsk and Irkutsk (approximately 2700 km and 5300 km from Moscow accordingly) are also taken into account, then the total distance from the warehouse in Derbyshire to the consumer can be up to 8400 km. The pilot supply of Radius electrofusion fittings to Russia showed that packaging failed at such long distances, therefore the decision was taken to significantly increase the cardboard thickness of the boxes.

Soon after the pilot, POLYPLASTIC announced its intention to deploy production of the high-demand Radius fittings to Russia. Import substitution, that the company was involved in for the last twenty years, had suddenly become a trendy idea. However, it is mainly prevailed in agricultural sector. The deployment of high-tech products such as electrofusion fittings made by injection moulding requires long-term and vast investment along and highly skilled and qualified personnel.

Nevertheless, the management of POLYPLASTIC Group took the decision to immediately deploy production of Radius fittings in Russia. POLYPLASTIC is the only Russian enterprise to implement production of electrofusion fittings despite the crisis.

In October 2015, Klimovsk Pipe Plant implemented production of smaller diameter fittings (from 20 to 40 mm). These are in high demand.

Relocating the fully automated line from Britain to Russia secured ongoing domestic production of the traditional high quality products that have become so popular amongst consumers over the last two years.

Moulding at Klimovsk Pipe Plant has a long history. Moulding equipment has been upgraded over the last few years to cope with increased injection volume and product weight. Currently moulding department of Klimovsk Pipe Plant can produce PE items weighing up to 33 kg.

The use of robots to automate some stages of moulding process is not a new feature at the Klimovsk Pipe Plant, however a fully automated cell able to produce a new fitting every 20 seconds was a new experience. Two-weeks summer training for the leading moulding specialist from Klimovsk Pipe Plant proved very useful.

Radius fittings made in Russia are also financially attractive to the local consumer as import substitution also goes hand-in-hand with a product price reduction.

NEXT GENERATION OF PE–STEEL TRANSITION FITTINS – INJECTION MOULDED

By Tatyana Chekanova
POLYPLASTIC Group

Kokhanovsky Pipe Plant (the Belorussian production branch of POLYPLASTIC Group) implemented production of PE-Steel transition fittings of the most common sizes (32x32, 63x57, 110x108 mm) at the end of 2007.

A PE-Steel transition fitting is a straight joint that connects PE and steel pipes of the same diameter. It is usually produced by pressing a steel pipe into a PE socket, with an additional PE clamp sleeve reinforcement. This type of fitting is designed for buried PE gas pipelines such as GOST R 50838 or others.

In 2015, the deployment of new technology and a technical upgrade switched the production process from multi-level manual assembly. Now the products are made by injection moulding using modern forming machines.

A steel pipe piece and sealing ring are placed in the special injection mould and a few seconds later you get a ready product. This method reliably fixes the steel part into the joint and gives complete integrity without the need for a clamp sleeve reinforcement.

This advanced technology enables the fittings to be made faster than ever before. Injection moulding also provides higher quality (within one batch of products and from batch to batch). Greater performance consistency is also achieved as opposed to traditional manual production where quality depends on the experience and skills of the employee.

The Kokhanovsky Pipe Plant is currently the only enterprise in FSU producing PE-Steel transition fittings using the injection moulding method.

The welding of transition fittings with PE pipes is performed according to SP 42-103 using an electrofusion coupler or butt fusion. The new design of fittings has been optimised and the customer now has the opportunity for poor welding errors to be correct as the length of the PE pipe section of these new products allows for a bad coupling to be cut and the transition welded again.

RADIUS TAPPING TEES ARE NO LONGER FOREIGN

By Tatyana Chekanova,
POLYPLASTIC Group

Radius electrofusion fittings – couplings ranging to 400 mm, elbows and tees up to 180 mm, and transition pieces up to 250 mm – were introduced into the Russian market in autumn 2013. Two years later POLYPLASTIC Group started production of small diameter Radius fittings in Russia (see "Russian fittings with English origin" on page 46).

This form of import substitution quickly helps to reduce product prices which makes a positive difference during an economic crisis.

The next step in this direction for POLYPLASTIC Group is the deployment of tapping tees (saddles) and electrofusion fittings used for gas pipelines. A saddle is an analogue of a tee joint, but with a higher price tag, however, it is important to understand that these products are used in completely different situations. For example, the use of a tee joint for the construction of a new gas pipeline is economically justified. But the situation is completely different with live insertion into an operating pipeline. Using a cheap tee means stopping the gas supply. As well as inconveniencing customers, this also requires additional expenditure for special mechanical and hydraulic equipment, repair (sleeve) fittings for reinforcement of the squeezed area and saddle connection which acts as a purge gas line – plus other related works. When the saddle connections are used, there is no need for all of this as the installation is done without a pressure decrease or the associated disruption for customers. In most cases the business case goes in favour of saddles as the new customer connection does not cause any problems with supply to their neighbours: when customers are not disconnected from the gas supply, they don't mind the construction works.

Gas distribution companies are the main consumers of the saddles.

The Gazprom programme for gas distribution network development in Russian regions involves construction of inter-settlement gas pipelines. The pipes range from 63 mm to 225 mm. Consumers connect to these main pipes with tapping diameters of 63 mm and 32 mm. The most popular saddles used are for pipe diameters of 63–160 mm and tapping diameters of 32 mm and/or 63 mm.

Standard Radius tapping tees with incorporated cutters are top quality products popular in the UK. Like other Radius fittings, these products are certified by British Gas and meet the toughest requirements of the UK gas industry. The main reason why this product hasn't been previously offered in the Russian market is the absence of a mounting clamp. This is not obligatory, but highly desirable if used in Russia as it eliminates the need for special clamping devices and ensures a grip and saddle close fit with the pipes during welding.

POLYPLASTIC Group took the decision to naturalise the three most popular saddle sizes in Russia – 63 mm, 110 mm, 160 mm of the main pipeline with tapping diameter of 63 mm. With these three sizes, it is easy to expand the range of the saddles with similar products with a tapping diameter of 32 mm supplementing the saddle with a 63 x 32 electrofusion transition piece.

Radius Systems developed a special design of polyethylene mounting clamp with metal fixtures to help standardise saddles for the Russian market.

The set of mounting clamp consists of:

– a plastic strap produced by pressure moulding
– a specially designed steel frame
– a U-shaped bolt
– two nuts

Manufacturing of the various elements used in Radius saddle mounting clamps, as well as assembly of the components, is done at the Kokhanovsky Pipe Plant, the Belarus production facility of POLYPLASTIC Group. The final product meets all the requirements of GOST R 52779-2007 Polyethylene Fittings for Gas Pipelines: General Specifications.

The Radius saddles with mounting clamp made in Belarus offer the highest quality at a reasonable price and are currently the only alternative on offer as an import substitution in the Customs Union zone.

Trade divisions of POLYPLASTIC Group traditionally offered clients tapping tees produced by Georg Fischer (Switzerland). Following the launch of Radius saddles in Russia, Swiss premium-class products will still be available, however the range of economy goods in Russia made by POLYPLASTIC Group will continue to expand.

THE PRODUCTION FEATURES OF LARGE DIAMETER PIPES

By Dmitriy Shapkarin

Large diameter plastic pipes are extensively used in modern utility networks. PE is the most commonly applied material. Extruded corrugated pipes are mainly manufactured in diameters up to OD 1200 mm. Pipes of greater diameter are normally spiral-wound pipes.

Pic. 1. Production of spiral-wound PE pipe with rectangular section profile

Pipes with a rectangular cross-section profile

One of the most common types of spiral-wound pipe features a rectangular cross-section profile, with welded-together side walls (pic. 2). The rectangular section profile gives the pipe wall higher stiffness at low weight.

The pipe is made by winding constantly extruded profiles on special tooling, comprising rotating rollers which transfer rotation to the pipe (pic. 1). The connection of the coils is done directly during winding, by welding them together. It is also possible to form extra outer and inner layers during the process, to give the pipe special properties including enhanced wear resistance, and better access for CCTV etc. During the profile winding process, the axial thrust builds up and pushes the ready pipe from the drum. The production process is continuous and pipes can be made of virtually any required length.

The principle of the pipes connection is based on their design features. The inner profile wall is cut at one end, and the outer profile wall at the other end, making an inner and outer thread. Pipe sections of the required length are then screwed together. This way of connecting pipes is especially easy for live insertion, when using trenchless pipeline renovation to avoid any service disconnection. Pipe connection can also be carried out using a manual extruder.

Krah Technology

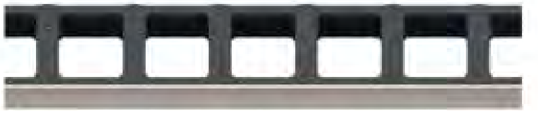
One of the main features of Krah technology is the design of the mandrel, where a future pipe profile is gradually formed. Mandrel is a steel cylinder, not shorter than the pipe. The mandrel is heated up to 200°C using gas torches before the profile winding process (pic. 6). A two-layer co-extruded band of melted polymer (PE or PP) is wound on the mandrel and forms the inner layer of the pipe. The inner layer is extruded using light material, and is used as an indicator of the wear and integrity of the pipe during operation. The socket and spigot are formed simultaneously as the winding of the first layer makes one piece. Wound layers are continuously heated with electric heaters to facilitate bonding. After the inner layer, the hollow profile with a circular section is wound in one or several layers, depending on the pipe specification (pic. 3).

When the profile winding has been completed on the mandrel, the pipe is then transported to the cutting line where the spigot is treated on the outside diameter. This will be done according to the design: for a connection with sealing rings, or for electrofusion welding.

After cooling, the pipe is taken out of the mandrel. The inner surface of the pipe will now resemble the surface of the mandrel, i.e. it is smooth and seamless, with no signs of winding.

The pipes are connected into the socket with a sealing ring, or by welding with an embedded heater.

Pic. 2. Wall profile of the spiral-wound pipe made fromrectangular profile



Pic. 3. Pipe wall profiles made using Krah technology

Pic. 4. Profile of the spiral-wound pipe with steel reinforcement

Pic. 5. Manufacturing of spiral wound PE steel reinforced pipe

Metal reinforced pipes with a structured wall

The most common pipe design has a smooth inner surface and spiral wound corrugations made of PE. The corrugation is reinforced with a steel profile (pic. 4). This design combines the major advantages of both PE and steel pipes: high reliability and corrosion resistance.

Pipe winding tooling features a similar design to the tooling for the pipes with a rectangular section profile. First, the inner PE layer of the future pipe is wound, then the profile is formed by applying pre-treated metal tape, coated with an adhesive layer.

The formation of the steel profile and its ring bend is carried out using rolling. The PE layer that will become an outer layer of the pipe is put onto to the steel profile. The bonding of the inner and outer PE layers and the steel profile is completed at the required force and temperature requirements and the walls are interfused.

Special thrust rollers help create the axial thrust required to release the pipe from the tooling. The pipe is then cut by wounds, the only place you can still see the steel layer is the butt end of the profile, which is covered by the end cups and welded using PE. Therefore, the steel profile is moulded into the PE shell and never comes into contact with soil or transported water.

During installation, the pipe ends are welded by a manual extruder and heat-shrinkable sleeves are applied.

Each of the above technologies has its advantages. The choice is determined by the project requirements governing pipelines, installations and operating conditions.

Pic. 6. Manufacturing of spiral wound PE pipe using Krah technology

PLANNED AND EMERGENCY REPAIRS OF GRAVITY SEWERS

By Igor Chepurin

City sewer pipelines, with diameters up to 3500 mm, built 40–50 years ago, mainly of reinforced concrete and steel pipes, require special attention and constant condition monitoring. The aggressive nature of domestic and industrial waste has significantly increased in the last few years. According to the research, the average emergency-free operating life of sewers in Russia is no longer than 15–18 years.

Analysis shows that 70% of the emergencies in sewer pipelines are caused by microbiological and gas corrosion of the concrete pipeline crown, which leads first, to a loss of structural properties and then destruction. Sewer pipeline failures often compromise the ecological and technogenic safety of the community, and can cause significant damage to the environment and to regional budgets.

In most cases, the renovation of sewer pipelines is carried out in the last stages of wear, when the crown loses its structural properties due to corrosion, leading to a danger of collapse. Moreover, the hydraulic properties of the pipeline at this stage, particularly flow velocity and capacity, are significantly worse. This is caused by silting; deposits that increase the unevenness and roughness of the inner pipe surface increase flow turbulence at the pipe bottom, which is prone to abrasive wear, especially at the concrete pipe joints.

The methods and materials used to renovate worn sewer pipelines must ensure structural properties without decreasing the flow capacity. Structural elements used for renovation must withstand ground load at the depth of the pipeline, have good hydraulic properties, and aggressive wastewater resistance.

In this article, we will describe a gravity sewer renovation method, which provides full structural properties and increases operating life by 50 years, without reducing the flow capacity.

Renovation of the pipeline using SPIROLINE PE thread modules means there is no disruption. Work is carried out live, while the pipeline remains in operation. This does not interfere with normal day-to-day city life, and can reduce the costs related to excavation works and bypass provision. This is the only renovation method where bypasses are impossible to arrange.

Opening of the pipe is done in small sections, normally, next to the manholes where compact pits are excavated. All repair works are done via these pits. In cases where pits are impossible to arrange, the works are done through the existing manholes and chambers.

Depending on the load at the depth of the pipeline, thread modules with hoop strength from SN2 to SN8 are chosen. The length of the thread modules depends on the manhole or pit size and can be from 1 to 13.5 metres.

The whole process of pipeline renovation can be split into four stages:

Stage 1 – technical inspection of the pipeline

Specialists examine existing pipeline design and construction documentation, carry out CCTV inspection of the internal pipeline to check its condition, study the route of the pipeline and choose the best location for the start pits. In some cases, mechanical and hydrodynamic cleaning might be required, and CCTV inspection can be carried out live. Service disconnection and pipeline drying is not required in this case. The bottom part of the pipeline is not exposed to gas corrosion, and, as a rule, will still be in a satisfactory condition. Consequently, the top of the pipeline and pipe joints are studied more carefully (pic.1) to evaluate the condition of the inner surface, any misalignment

Pic. 1. CCTV of gravity pipeline

Pic. 2. Opening of the crown of pipelines

Pic. 3. Pipelines bottom cleaning

of pipes, the presence of foreign objects, and the possibility of collapse.

A report showing the general technical condition of the pipeline and recommendations on renovation is compiled upon completion.

Stage 2 – project planning

As we are talking about current renovation of the pipeline where there are no changes to the position plan and technical characteristics, there is no need for costly and extensive design.

The work schedule includes:

– A description
– Drawings of the site layout
– Work stages
– The layout of the pits

Stage 3 – construction and installation works

At this stage, after all necessary approvals have been granted, the start and receiving pits are arranged. The crown of the reinforced concrete pipes is removed and the equipment for pipe cleaning is prepared (pic. 2).

Cleaning is done using a special metal tool pulled through the pipe by the winches set in the starting and receiving pits. It collects all deposits and large debris in just a few passes (pic. 3).

Then calibration of the pipe section is done. One of the thread modules (gauge) is pulled through the pipe from the start to the receiving pit. The gauge is checked for unacceptable damage. If no damage is detected, the pipe made of thread modules is pulled.

Pic. 4. Screwing-in of thread modules

The first thread module is fixed in the start pit using jacks. The second module is lowered, aligned to the first one. The modules are screwed using special tools (pic. 4). The made pipe is pulled inside the repaired pipeline for the length of the module using a winch. Next, the remaining modules are lowered and screwed in place. After the pull-through, preparation for gap filling begins. It is carried out from the start pit to the receiving pit using cement mortar type M-200, with additives providing high plasticity and inhibition (pic. 5).

Mortar injection into the void between the pipes is done from top to bottom, starting from the pipe end at the start pit. The stopper plugs are installed – a grouting plug in the start pit and a dead plug with level tappings in the receiving pit. The grouting is done in two stages to prevent the pipe floating-up from the bottom of the pipeline. The gap is filled to 60% of the height of the outer diameter of the thread modules. After the solution is set, the gap is filled in.

The receiving pit is prepared for backfill when the solution is 50% set (about two days). The start pit turns into the receiving pit for the next renovation section. Auxiliary equipment is dismounted in the receiving pit. The mould is set around the existing concrete reinforced pipe with the replacement pipe made of modules at the bottom. The grouting concrete casting of the pipe top is carried out above the pipe using wire mesh.

The backfill of the pit is achieved with layered compaction.

The process is repeated on the next section.

Final stage – return of the repaired section into operation

Pipeline renovation using SPIROLINE PE thread modules solves the following problems:

1. The renovation process involves thread modules with relevant hoop strength (not including the residual strength of the existing pipe) enough for load resistance at the given depth. The structural properties are completely restored for the whole operating life.
2. The pipeline renovated using PE thread modules is resistant to aggressive wastewaters, gas and microbiological corrosion, and has high abrasive resistance. The total operating life of the pipeline is extended for not less than 50 years.
3. Thread modules joint integrity is achieved by gap grouting between the pipes, which solves the problem of soil pollution with aggressive sewer drains, soil erosion around the pipeline and ground water infiltration.
4. The flow capacity of the pipeline is not reduced by the smoothness of the inner surface and great hydraulic properties of PE pipes, despite the insignificant reduction of the inner diameter.

The described technology has been used in Russia since 2008. Over 28 km of worn pipelines with diameters from 500 mm to 3500 mm have been repaired since then. The popularity of the method is due its simplicity and reliability. There is no need for extensive design works, enabling more efficient renovation of a pipeline, without damaging other utilities or the landscape.

Pic. 5. Filling of the void between the pipes.

THE PAST, THE PRESENT AND THE FUTURE OF POLYETHYLENE MANHOLES FOR WATER DISPOSAL SYSTEMS

By Vilnis Puce

History

The use of manholes started with the development of water disposal systems. External underground sewage networks have always had accessible points for inspection and cleaning. These access points were often made of the same materials as the sewer pipes – clay, stone, bricks and concrete. Many old cities still have sewer systems largely composed of brick, ceramic and concrete pipes today.

Over time, the technological improvements in the production of construction materials allowed the mass production of pipes, which led to a reduction in cost and an improvement in the quality of products. Concrete pipe plants began production of parts for manholes, as the in-situ concrete moulding process was more labour-intensive and resulted in poorer quality structures. Concrete manholes, as we know them today, have been in use since the nineteenth century.

In addition to pipes made from conventional materials, the start of the 1930s saw mass production of plastic pipes, made initially of PVC, and then of polyolefins, such as PE and PP. Plastic pipes had a significant advantage over concrete: because they are not susceptible to corrosion they can have a significantly longer operating life. In addition, the greater integrity of their joints protects against leakage and the infiltration of ground waters into the water disposal system.

From the second half of the last century, water disposal systems were split into domestic and storm water disposal systems to ensure better and more cost-effective treatment of municipal sewers. The corrosion rate of concrete in the domestic sewers had significantly grown due to high concentrations of methane. This could be one of the main reasons for the rapid rise in production of plastic pipes for external gravity sewers. By comparison, the plastic fittings and manholes market evolved relatively slowly. It required large investments in moulds, plastic materials, and a vast diversity of products, whereas concrete required fewer costs and allowed in-situ moulding. As a result, modern external sewer systems are usually made of two materials – plastic pipes and concrete manholes. Such a combination remains controversial, as the technical advantages of plastic pipes are undermined at the point of connection with the concrete manholes.

Development of plastic manholes

Europe was traditionally a trend setter for the application of plastic pipes in sewers. Scandinavia was most open to innovations with the highest number of plastic pipelines in the world, compared with other materials (concrete, cast-iron etc.). So it is no wonder that the development of plastic manholes for sewers started in Scandinavia. The technological progress in sewer networks maintenance was one of the major factors of this development, e.g. hydraulic machines for high pressure jetting, and CCTV

Pic. 1. PE560 UPONOR Inspection Chamber

Pic. 2. K400 Mabo Inspection chamber

inspection of the pipelines. These new technologies made pipeline servicing from the ground possible via small manholes. Plastic manholes could compete with the concrete versions, providing low cost maintenance and extended operating life. In the 1980s, Uponor started production of PE manholes with chambers made of smooth pipe with diameters of 560 and 800 mm, and trays welded using manual extruder, base and pipes for connection to the pipelines (pic. 1). This design is still used in Finland today.

The development of modern manhole systems started in the 1990s when Norwegian Mabo started production of the first moulded bases for inspection chambers, OD/DN 400 mm (pic. 2). The initiative was taken by Dutch Wavin Nordic, and then similar production kicked off in other developed countries of Western Europe: Germany, Holland and Great Britain. In 2000, the 400 mm inspection chambers market in Germany hit over 100,000 units per year. The application scale of inspection chambers depends on the approach of the operating companies, e.g. 400 mm inspection chambers are widely used for city networks up to DN 400 mm in Scandinavia, Baltic states and Poland. Germany, France and Great Britain allow application only within certain areas and in private residences and cottage estates, with diameters up to 200 mm.

Modern PE manholes systems

The second stage of plastic manhole development started in the 2000s. Israeli Hofit and Romold started using rotational moulding technologies. They tried to create an alternative to concrete manholes, with shaft diameters of 800 and 1000 mm, to achieve mass application of plastic manholes in mains networks in the previously mentioned “conservative” countries (pic. 3). Rotational moulding technology has a number of advantages, including the relatively low cost of moulds. So the price of the first modular

1000 mm manholes was quite competitive when compared with their concrete counterparts. Unfortunately, the quality, especially with regard to static load resistance and integrity, did not meet the expectations for mass application in developed Western European countries. As a result, we have mainly seen a rise of rotational moulding manhole applications in Eastern and Southern Europe.

Holland's Wavin has invested heavily in moulds and equipment for low pressure moulding, trying to eliminate the disadvantages. The Tegra 1000 modular manhole (pic. 4) proved much better than rotationally moulded analogues. However, the connection sizes were no greater than OD/DN 315 mm. The limited range of the manhole base configurations, together with the problems of additional manual extruder welding, didn't help to promote mass application of the new product.

Pipelife, Kaczmarek, Rehau followed Wavin and tried to create their 1000 mm manholes using various low pressure moulding technologies (pic. 5). Low pressure moulding uses low cost aluminium moulds, creating a manhole with a light inner layer, and reducing consumption of raw materials. The downside of this technology is the need to weld extra connections which can compromise integrity due to the different yield points of the materials. All attempts to create an ideal 1000 mm manhole led to limited manhole base designs and a small range of connections, mainly up to OD/DN 315 mm, with quality and robust welding of extra connections proving challenging (especially for diameters above OD/DN 400 mm).

The main alternative for moulded modular manholes was a welded manhole made of pipes with a structured wall (two-layer corrugated or spiral-wound walls). A manual extruder is used to produce such manholes. The technology is very labour-intensive, and in many cases, does not guarantee good quality compliance, static load resistance and long-term integrity.

Regulation

Plastic manhole applications in Europe are regulated by EN 13598-2, Plastics piping systems for non-pressure underground drainage and sewerage. Unplasticised poly(vinyl chloride) (PVC-U), polypropylene (PP) and polyethylene (PE). Part 2. Specifications for manholes and inspection chambers in traffic areas and deep underground installations.

It should be noted that European regulation was created together with leading manufacturers of plastic manholes at the beginning of the 2000s and has a number of compromises, e.g. in deformation resistance of the manholes with an outer load in places with high levels of underground waters etc. These compromises allowed the use of manholes made by all major producers, with some limitations.

In Russia, from 1 July 2015, a new GOST 32972-2014 Plastic manholes for sewerage came into force, which is essentially an adaptation of EN 13598-2. There is substantial work being done on updating construction regulations to enable wide use of plastic manholes in the construction of drainage network systems.

Conclusion

In summarising this brief review on development of plastic manholes market it should be highlighted that:

– plastic inspection chambers have replaced concrete ones in the niche market;

– plastic manholes with diameter over 800 mm (mainly 1000 mm) still make a small share of the market due to their price, and top quality manholes don't always justify the price;

– rotationally moulded 1000 mm manholes don't meet all the requirements of GOST or EN or meet the requirements with some exception;

– welded 1000 mm manholes don't always meet GOST or EN requirements due to high dependance of human factor;

– moulded 1000 mm manholes have standard solutions with only small diameters of connections (up to OD/DN 315 mm) and limited range of base designs;

– Russian market, apart from inspection chambers, needs 1000 mm and over plastic manholes with unlimited range of manhole base designs;

– Russian market needs plastic manholes with connections up to DN 1000 and solutions for servicing of up to 3000 mm.

Pic. 3. 1000 mm rotational moulded manhole

Pic. 4. Tegra 1000 mm Wavin manhole

Pic. 5. 1000 mm Pipelife manhole

FLOWLINES MADE OF SYNTHETIC YARN REINFORCED POLYETHYLENE PIPES

By Alexander Tarakanov

A number of Russian oilfields are currently entering the last stage of their development, and are showing a high water content in the crude. The number of failures, and the premature replacement of many steel pipes makes the issue of the reliability of steel pipelines more significant than ever. The main reason given for flowline failure is internal corrosion, as a result of formation water coming into contact with the metal surface.

Oilfields are designed with a network of pipelines:

- **flowlines** (Ø89–114 mm) – pipelines for transportation of products from the oil well (oil, water, associated gas) to metering separators, at pressures up to 4.0 MPa.
- **oil and gas gathering mains** (Ø89–720 mm) – pipelines for the transportation of products from the metering separators to the booster compressor station and the initial water separation units, operating at pressures up to 2.5 MPa.
- **pressure oil pipelines** (Ø273–720 mm) – pipelines for processed or partially processed oil from the oil gathering facility and booster compressor station to the central production facility, operating at pressures up to 4 MPa.
- **water flooding pipelines** of oil reservoirs and brine disposal in deep input horizons: low pressure (Ø114–530 mm) – up to 1.6 MPa; high pressure (Ø89–325 mm) – 10–20 MPa.
- **gas pipelines** (Ø273–530 mm) – for transportation of associated gas from oil separation units to gas treatment facilities, or to the consumer, operating at pressures up to 0.8 MPa.

The main corrosion factors of transported agents in the oil flowlines are:

– The pH factor and salinity of oilfield water

– Water-dissolved gas content (including carbon dioxide, oxygen and hydrogen sulphide)

– Micro bacterial corrosion (from sulphate reducing bacteria, hydrocarbon oxidising bacteria and others)

– Solid particles

– Mineral deposits.

Oil and gas companies bear huge losses and unacceptable waste during standbys caused by emergency shutdowns, and the repairs and replacements of worn steel pipelines. They may also suffer losses in transported products, a drop in quality, and environmental pollution. It is obvious that they need pipelines that can operate reliably in the long term [1, 2].

Anaconda™ synthetic yarn reinforced pipes, by Technologiya Kompositov, Perm, are a viable alternative to steel pipes in many instances. These pipes use pipe grade PE and high tension polyester threads, which are resistant to corrosive agents (as described above) which are transported via flowlines, and are also present in the soil.

PE pipes are resistant to external corrosion, which eliminates any need for electrochemical protection units. The inner surfaces of PE pipes are resistant to corrosion and carbonate deposits. This ensures that the flow capacity remains the same, throughout the operating life of the pipe, which cannot be said of steel pipes [3]. Pipe-grade PE pipes have 2.5 times higher hydroabrasion resistance to solid particles compared to steel pipes [4].

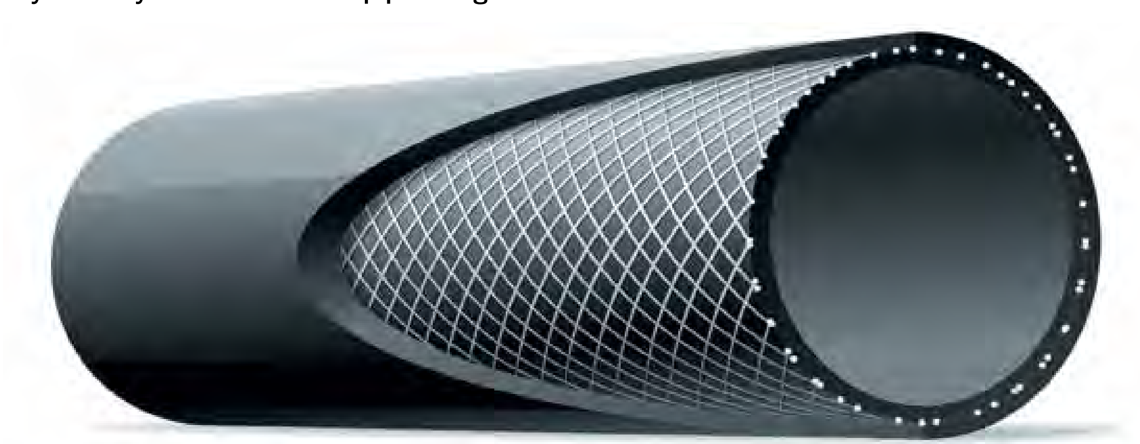
Anaconda™ synthetic yarn reinforced pipes [5] are manufactured with outer diameter of 75, 90, 110, 125, 140 and 160 mm. The pipes are designed for the construction of pipelines with operating pressures up to 4 MPa, and an operating temperature in the pipe wall from –15° to +60°C. The designed operating life of AnacondaTM at oilfields is 25 years.

Anaconda™ pipes are highly flexible and can be wound into coils. 75–125 mm pipes can be supplied in lengths from 350 to 150 m respectively.

Pipelines made of these pipes can withstand ground movement during earthquakes, soil heaving and subsidence, thus increasing their survivability.

Anaconda™ pipes notably expand due to their high coefficient of linear thermal expansion (up to $220 \cdot 10^{-6}$ 1/°C) and low PE creep modulus under pressure and positive temperature drop. In order to keep pipelines made of these pipes at the designated elevation, they are only laid underground; the pipe is then held in place by the ground.

Pic. 1. Synthetic yarn reinforced PE pipe design



Pic. 3. Oil flowline positioning

Anaconda™ pipes tangential elasticity allows them to withstand water freezing without reducing structural properties after defrosting.

Pipes are connected together by welding. What distinguishes the Anaconda™ pipes here is that welding consists of two standard operations: butt fusion with further bead removal, and welded seam reinforcements using electrofusion connection coupling [6]. Seam axial resistance at butt fusion is lower than the pipe strength, necessitating coupling welding for extra reinforcement.

Anaconda™ pipes bends and risers are completed using elastic bending with a minimal radius not less than the accepted – 25 outer pipe diameters. This, in some cases, can also help avoid knees.

Anaconda™ reinforced PE pipes can replace steel flowlines, oil gathering mains and low pressure water flooding pipelines. From 2005, over 500 km of flowlines have been built using Anaconda™ at oilfields in Russia, Ukraine, Lithuania, Uzbekistan, and Kazakhstan.

Pipes with diameters up to 250 mm are currently undergoing design-engineering development, which will significantly extend the application range of reinforced PE pipes at oilfields.

Pic. 2. Uncoiling of Anaconda™ pipe during construction of oil flowline

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HOW TO CONTROL BEAD DURING BUTT FUSION WELDING OF LARGE DIAMETER PE PIPES

By V. Volkov, N. Prokopiev, V. Kimelblat

Visual and dimensional inspection (VDI) of welded connections is a major quality control component for butt fusion of plastic pipes. The principles of VDI are used by welders to discard faulty joints immediately after welding. VDI is also used by construction company and customer quality controllers as well as representatives from the Technical Supervision Authority. Despite some differences in approach to VDI in various countries, a common visual evaluation of the appearance of the PE pipes welded joints can be highlighted based on American recommendations (pic. 1).

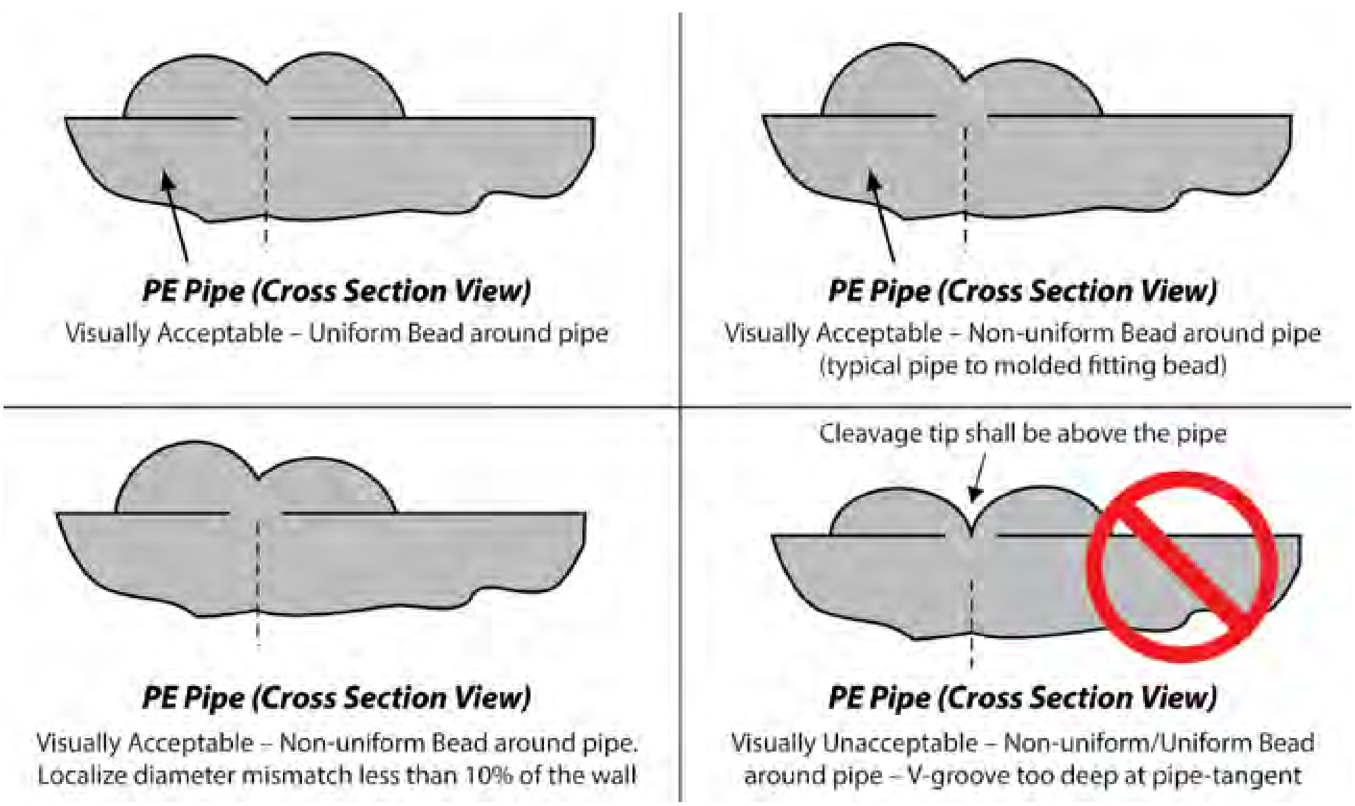
German DVS [2], which for many decades have been the source for Soviet and Russian developments in butt fusion joint control, contain more detailed descriptions of defects found during VDI, e.g. cracks, scratches, reduced cross-sections near the welded joints, asymmetry, unevenness of bead and other defects.

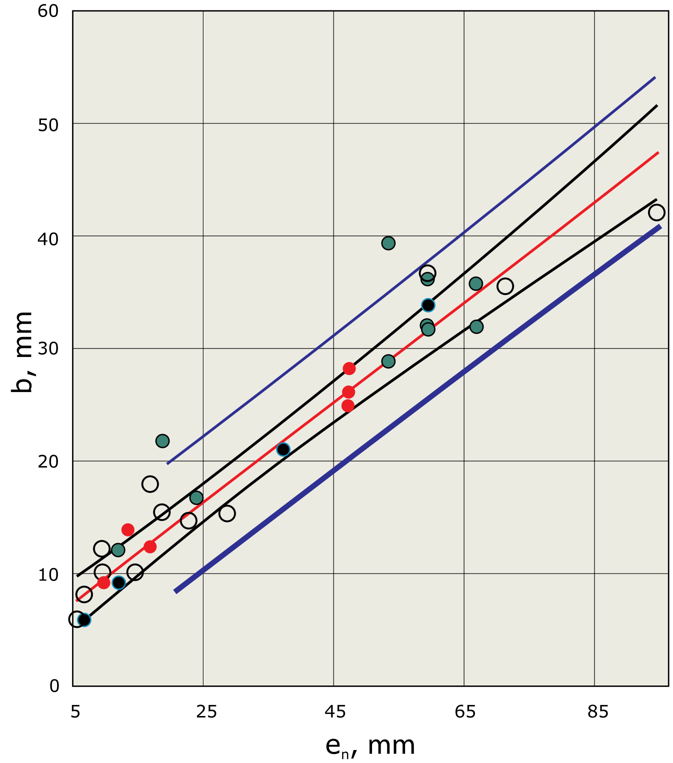
GOST R 54792-2011 [3] contains satisfactory traditional criteria of rejecting defective welded joints based on their appearance. GOST R 54792-2011 VDI conditions should be applied for PE joints made by butt fusion with a nominal outer diameter dn from 63 to 225 mm and nominal wall thickness en from 3.6 to 20 mm.

Welded objects i.e. plastic pipes and fittings are increasing in geometrical sizes and new types of polymeric materials are being applied. Some butt fusion problems observed in practice are due to the fact that generally accepted technological norms are far behind pipe production innovations.

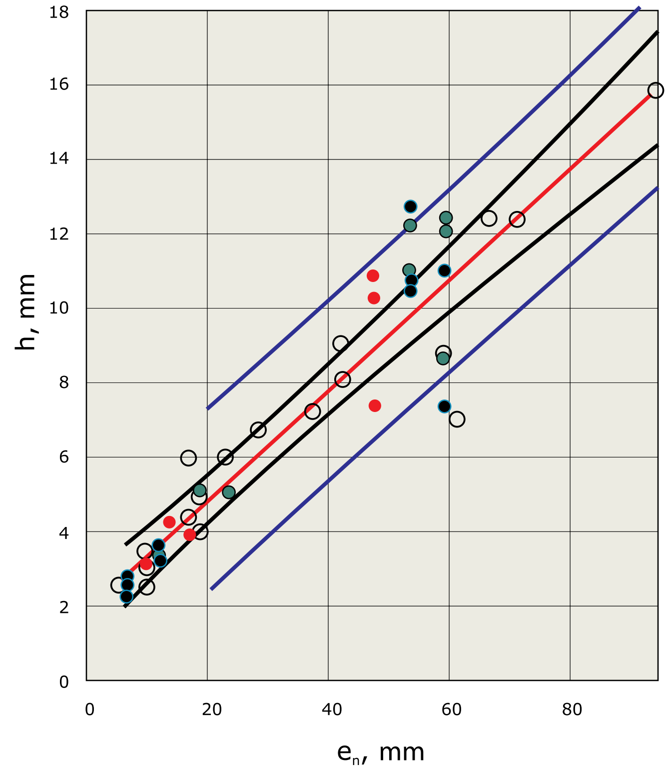
Traditional DVS technical codes contain bead sizes. Deviation from the norm mean improper pipe preparation for welding and a deviation of the major welding parameters from the optimal values.

Pic. 1. Visual evaluation of allowable and disallowable bead shape





Pic. 2.
Bead width to pipe wall thickness dependency (Single Low Pressure procedure, summer). White points – unknown material. Black points – PE100 2HT11-9. Green points – Sabic P6006. Red points – PE 100 6949C. Red line is the trend line, black lines is confidence interval for the function.



Pic. 3.
Bead height to pipe thickness dependency (Single Low Pressure procedure, summer). White points mean unknown materials. Back points – PE 100 2HT11-9. Green Points – Sabic P6006. Red Points – PE100 6949C. Red line is the trend line, black lines are confidence interval for the function.

The criteria for bead sizes in the new DVS [2] codes, containing too great and too small bead volume, are not quantified. These codes require comparison of the evaluated bead with the control samples instead. It is standard practice in Germany to involve experts in the welding of testing samples, which can then be used by other welders. These works are postponed due to the fact that obtaining more universal criteria requires very expensive experiments. To obtain results for welding super large diameter pipes would cost millions of roubles.

The authors have managed to carry out a significant volume of experiments required for obtaining new criteria for VDI of welded joints with wall thicknesses of e_n up to 95 mm.

PE pipes made in Russia and abroad have been used: Sabic P6006, 6949C and PE 2HT11-9. Some pipe types were unidentified.

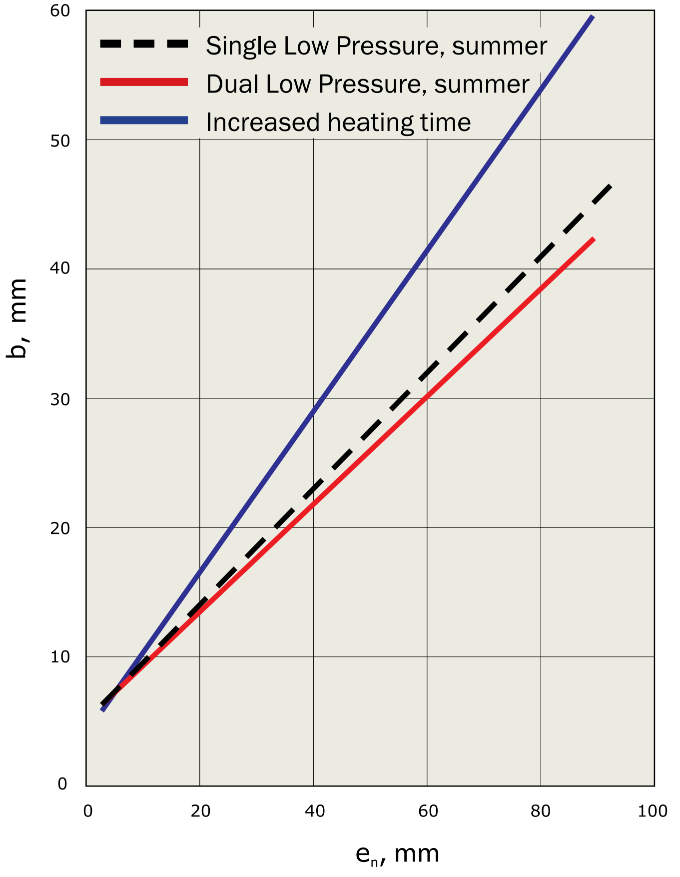
All joints were welded using butt fusion at a heating plate temperature of 220°C. The welding was done in three different modes according to GOST R ISO 55276-2012. Various welding machines were used for welding: Georg Fischer – Omicron, WIDOS, KWH, BADA, McElroy and USPTEP.

Alignment of the long (up to 12 m) large and super large diameters pipes was done using adjustable roller supports made by the Kokhanovsky Pipe Plant.

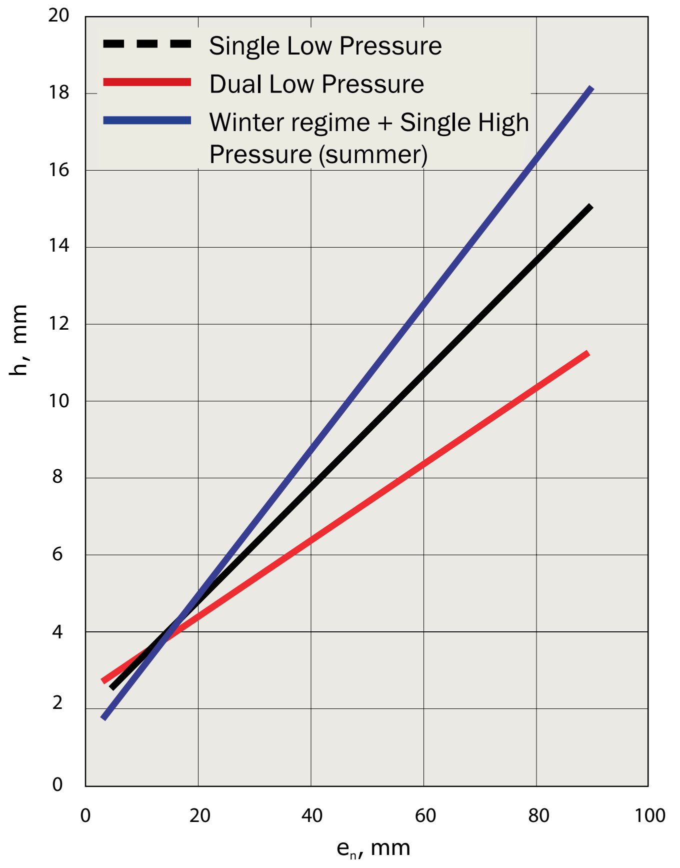
Qualification and skills were not taken into consideration deliberately as the welding was done by experts.

The thickness of the pipe wall is the most obvious factor that influences the bead parameters i.e. volume, height and width. According to GOST R ISO 55276-2012 and generally accepted tradition, the duration of heating, welding pressure increase, and cooling under pressure depends on the thickness of the pipe walls. These dependencies are directly proportional and this makes some process engineers use linear extrapolation of data obtained during welding of thin pipes to big thickness pipes. In fact, bead sizes nonlinearly tend to depend on the thickness of the pipe wall [4], and rheological characteristics of molten mass also need to be taken into account as a dependency factor. Some areas of nonlinear function can be approximated to linear function sections, which are more convenient for the control of welded joints e.g. bead width – wall thickness dependency is quite reasonably approximated to linear sections in small pipe wall thicknesses [3]. Bead height has a linear dependency from en with pipe wall thicknesses up to 40 mm.

As a result of statistical processing of experimental data obtained by the authors, the following adequate approximating function for bead size – pipe wall thickness dependencies in e_n range up to 95 mm were derived:



Pic. 4. Bead width to thickness of the pipe dependency, GOST R ISO 55276-2012 procedure and welding conditions.



Pic. 5. Bead thickness to wall thickness dependency, GOST R ISO 55276-2012 procedure and welding conditions.

Pic. 6. Welding of 95 mm wall thickness pipe

Table 1. Allowable bead sizes in butt fused welded joints made of PE 100: Single Low Pressure fusion procedure for wall thickness e_n from 20.1 to 45.3 mm

№	e_n, mm	d_n, mm	*SDR*	Calculated bead size, mm	
				b	*h*
1	20,1	355	17,6	14,1±5,9	4,9±2,2
2	20,5	225	11	14,3±5,9	4,9±2,2
3	20,6	280	13,6	14,3±5,9	4,9±2,2
4	21,1	355	17	14,5±5,9	5,0±2,2
5	22,7	250	11	15,2±5,9	5,3±2,2
6	23,2	315	13,6	15,5±5,9	5,3±2,2
7	23,7	400	17	15,7±5,9	5,4±2,2
8	25,4	280	11	16,4±5,9	5,7±2,2
9	25,5	450	17,6	16,5±5,9	5,7±2,2
10	26,1	355	13,6	16,8±5,9	5,8±2,2
11	26,7	450	17	17,0±5,9	5,8±2,2
12	28,3	500	17,6	17,7±5,9	6,1±2,2
13	28,6	315	11	17,9±5,9	6,1±2,2
14	29,4	400	13,6	18,2±5,9	6,2±2,2
15	29,7	500	17	18,4±5,9	6,3±2,2
16	31,7	560	17,6	19,3±5,9	6,6±2,3
17	32,2	355	11	19,5±5,9	6,7±2,3
18	33,1	450	13,6	19,9±5,9	6,8±2,3
19	33,2	560	17	19,9±5,9	6,8±2,3
20	35,7	630	17,6	21,0±5,9	7,2±2,3
21	36,3	400	11	21,3±5,9	7,2±2,3
22	36,8	500	13,6	21,5±5,9	7,3±2,3
23	37,4	630	17	21,8±5,9	7,4±2,3
24	40,2	710	17,6	23,1±5,9	7,8±2,3
25	40,9	450	11	23,4±5,9	7,9±2,3
26	41,2	560	13,6	23,5±5,9	8,0±2,3
27	42,1	710	17	23,9±5,9	8,1±2,3
28	45,3	800	17,6	25,3±6,0	8,6±2,3

For the bead width *b*

$b = 0.447 \cdot e_n + 5.089$ (R=0.95), (1)

and for the bead height h

$h = 0.147 \cdot e_n + 1.920$ (R=0.92), (2)

where R – correlation coefficient.

Confidence limits for the data (yHt, yBt), shown on pictures 2 and 3 (blue curves), are calculated at confidence probability of 95%.

Tables 1 and 2 show allowable bead sizes, calculated for corresponding pipe sizes.

If bead sizes are lower than shown in tables 1 and 2, it can be assumed that welding parameters are not adequate for rheological properties of materials and welding conditions:

– low temperature of the heating plate,
– insufficient heating time,
– low pressure in the welding area,
– process standby is held for too long.

If the bead sizes are greater than shown in tables 1 and 2, it can be assumed that:

– the temperature of the heating plate, heating time and welding pressure are too high.

Based on the data in these tables, welders and controllers can evaluate the quality of 100% of welded joints and take

Table 2. Allowable bead sizes in butt fused welded joint made of PE 100: Single Low Pressure fusion procedure for pipe wall thicknesses e_n from 45.4 to 95 mm

№	e_n, mm	d_n, mm	*SDR*	Calculated bead size, mm	
				b	*h*
1	45,4	500	11	25,4±6,0	8,6±2,3
2	46,3	630	11	25,8±6,0	8,7±2,4
3	47,4	800	17	26,3±6,0	8,9±2,4
4	50,8	560	11	27,8±6,0	9,4±2,4
5	51,0	900	17,6	27,9±6,0	9,4±2,4
6	52,2	710	13,6	28,4±6,0	9,6±2,4
7	53,3	900	17	28,9±6,0	9,8±2,4
8	56,6	1000	17,6	30,4±6,1	10,2±2,4
9	57,2	630	11	30,7±6,1	10,3±2,4
10	58,8	800	13,6	31,4±6,1	10,6±2,4
11	59,3	1000	17	31,6±6,1	10,6±2,4
12	64,5	710	11	33,9±6,2	11,4±2,5
13	66,1	900	13,6	34,6±6,2	11,6±2,5
14	66,7	1400	21	34,9±6,2	11,7±2,5
15	68,0	1200	17,6	35,5±6,2	11,9±2,5
16	71,1	1200	17	36,9±6,3	12,4±2,5
17	72,6	800	11	37,5±6,3	12,6±2,5
18	73,5	1000	13,6	37,9±6,3	12,7±2,6
19	81,7	900	11	41,6±6,5	13,9±2,6
20	83	1400	17	42,2±6,5	14,1±2,6
21	88,2	1200	13,6	44,5±6,6	14,9±2,7
22	90,8	1000	11	45,7±6,7	15,3±2,7
23	94,8	1600	17	47,5±6,8	15,9±2,7

decisions on mechanical testing of the joints and optimise the welding mode.

Equations 1 and 2 refer to welding using the Single Low Pressure fusion procedure in favourable weather conditions.

If technicians, in full compliance with GOST R ISO 55276-2012, use American high pressure welding machines, choose a Single High Pressure fusion procedure, or prefer to choose a Dual Low Pressure procedure, then the correction coefficients in pictures 4 and 5 should be used. This also applies if welders extend the heating time due to low ambient temperatures.

The authors thank the management of Klimovsk Pipe Plant and KTZ colleagues, especially K. Gotovko, Georg Fischer – Omicron, Sofipo and AND-Tekhnologiya, for their help during these experiments.

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FIRST FIVE THOUSAND MANHOLES: NEW CABLE NETWORKS IN MOSCOW

By Vitaliy Kiryushatov

Last year, the Government of Moscow introduced the My Street Programme to redevelop avenues, streets and lanes in all parts of the capital. Sergey Sobyanin, Mayor of Moscow explained what the programme covers, "Redevelopment of the streets includes: installation of cycling routes, upgrading pedestrian footpaths, house fronts and billboards as well as cables entangling many building and streets of Moscow that do not do any justice to the overall view of the city."

Obviously it is impossible to upgrade all streets at once, not least because this would bring the already congested Moscow total standstill. The decision was therefore taken to start work on a specific selection of streets and lanes including Triumphalnaya Square, Frunzenskaya and Novodevich'ya Embankments, Bolshaya and Malaya Nikitskaya streets, Ordynka, Mytnaya, Tulskaya etc. and seven outbound routes – Schelkovskoe Motorway, Ryazanskiy Prospect, Kashirskoe, Varshavskoe and Mozhaiskoe Motorways, Leningradskiy Prospect and Yaroslavskoe Motorway.

Design and survey works meant that thousands of kilometres of cable needed to be disguised. An underground solution was preferable, but the question was how. The design had to be reliable and remain operational for the long-term, but still be installed with minimal disruption.

Placing cables inside plastic pipes with PE manholes met these requirements fully. It is the most reliable and practical option as lightweight manholes are easy to assemble and quick to install.

Choice of material is only part of the process. It was also important to find a manufacturer with enough production capacity as well as internal R&D and quality control departments. This was vital as demand for manholes in 2015 alone exceeded 5000 units. The manufacturer also had to be financially strong.

POLYPLASTIC Group was chosen as the major supplier. The company has ten pipe plants, one of which is the Klimovsk Pipe Plant (KPP). This is the largest plant in Europe and can manufacture 100 manholes per day.

The project faced a number of problems, mainly related to the design data conflicting with the real settings as some communications had not been reflected in the survey plan. Engineers from POLYPLASTIC Group solved the problem by working on new manhole designs and the production department remade the units. The manholes that were already

at the site were quickly corrected in-situ by the project technical support team using a hand extruder.

KKSP PE cable manholes are an innovative solution from POLYPLASTIC Group. They were specially designed in collaboration with the City's production and technical departments. The cable manholes are manufactured using SPIROLINE PE pipes with an inner diameter of 1000 mm, no less than 10 mm thick plastic sheets and SDR 13.6 fitting pipes. Each manhole is fitted with at least eighteen 110 mm branches and between 8 and16 branches with diameter of 63 mm. Each branch has a cap. Galvanized stands and consoles, plus a plastic divider to separate power cables and low-current cables, are found inside each manhole. The top of the manhole also has a welded PE lead with a locking device, so that all gaps are completely sealed. Those manholes that are located under the road have 600 mm diameter neck which allows for installation under a UOP-6 concrete reinforced support plate.

All the materials used to produce the manholes including the pipes and sheets, are of the highest quality and are made in POLYPLASTIC Group plants. Great attention is paid to the appearance and testing of the manholes before they are installed in the city centre. POLYPLASTIC specialists chose red and black for the best appearance. Despite the large volumes required, all the manholes go through strict quality control checks at the laboratory. During the tests each manhole is filled with a minimum of 1 cubic meter of water for 24 hours.

Testing and shopping 100 manholes a day is a precision operation and is currently being done very successfully.

PIPES AND MANHOLES FOR STRATEGIC AVIATION BASE

By Sergey Uzhvyuk

27 June 2012 marked the start of reconstruction at the Russian Air Force base near Engels, Saratov Region. The Engels Airbase is strategically important, as highlighted by Vladimir Putin, President of the Russian Federation, during a meeting in Saratov on 14 June 2012: “Serious consideration will be given to the modernisation of the airbase infrastructure. We have been commissioning about 7 new modernised airbases per year for the last four years, 28 in total. Another nine airbases are currently being reconstructed in Severomorsk, Chkalovskiy, Engels, Akhtubinsk, Krymsk, Eisk, Lipetsk, Chkalovsk in Kaliningrad Region, Korenovsk. Their modernisation lead to over 40 billion roubles worth of contracts. The work is currently being carried out and I hope it will be implemented to the best standards and on time”.

The reconstruction of the airbase was split into several stages, the first of which was completed in 2014. In February 2015, UAT OJSC Holding began preparation for the next large-scale stage, the reconstruction of the existing airfield, construction of new aircraft parking, renovation of the drainage network, installation of local waste treatment facilities and the construction of fuelling areas. The work began in March.

The second stage of airbase reconstruction was ready in November and the third stage of construction began in early August. This was carried out by specialists from Dorcentr who were working on the construction of water and drainage networks and local treatment facilities.

A construction project of such importance and tight deadlines depends on the coordination of materials suppliers if it is to run smoothly. The selection requirements were therefore particularly stringent, taking into account a range of factors including production output, technical support, previous experience and financial health. IVK AIR-Group, the airbase facilities

reconstruction division of POLYPLASTIC Group, was chosen to supply elements for water and sewer networks and local waste treatment facilities.

The specialists from POLYPLASTIC Group and IVK AIR-Group approached the task responsibly. Materials were not limited to pipes but included the full range of products: CORSYS type pipes, plastic manholes based on CORSYS SVT, reservoirs for local

waste treatment facilities made of CORSYS Plus pipes, fittings of different diameters ranging to 2200 mm. In addition, the technical team at POLYPLASTIC Group designed and produced special fittings for CORSYS Plus pipes with a diameter of 2200 mm that completely meet airbase construction regulations.

Project Management CJSC, the design company, used plastic manholes during the airbase reconstruction. This seemed impossible just a few years ago as there was a common belief that the market did not have the materials or producers able to offer alternative to traditional reinforced concrete manholes. Experts from IVK AIR-Group and POLYPLASTIC Group worked together to challenge the existing beliefs, first developing a solution on paper that proved the effectiveness of a polymer application instead of reinforced concrete. This was later proved in practice at Makhachkala Airport where their innovative designs were implemented for the first time.

All materials for the manholes: pipes, sheets etc. are made by POLYPLASTIC Group. This guarantees quality backed by the laboratory, the quality control department and by feedback from the construction companies. Each element goes through scrupulous tests and quality control prior to dispatch to the site. Everything gets checked from appearance and geometric characteristics, to the leak and impact resistance of the connection pipes.

This project has given POLYPLASTIC Group and IVK AIR-Group the opportunity to showcase their precision capabilities and raise the bar in production capacity.

The project will meet the standard and deadlines thanks to the smooth and coordinated working practices of all companies involved in the construction.

OMSK VOTES FOR INNOVATIVE PIPES

By Liliya Shleiger

The main street of Omsk is also known as Lenin Street (former Lyubinskiy Prospect) and dates back to the beginning of XIX century. The unique architectural heritage of the late XIX – early XX makes this site a city landmark with Federal Historical Heritage status.

Lenin Street is also on the list of reconstruction sites planned to be completed before the 300th anniversary of Omsk. The Fund for Omsk strategical development is the customer and Gazprom OJSC is an investor in the project.

The reconstruction project involves the replacement of both the water supply and the sewer networks on Lenin Street.

"Some of networks we are replacing were built before the revolution," says Evgeniy Reshetnikov, Director for Construction of Omsk Vodokanal. "It is obvious that their operating life has long gone. We took the decision to replace the water pipelines using plastic pipes."

POLYPLASTIC ZapSib won the bid to supply pipes and all the pipes and fittings arrived at the site in good time.

The construction work was carried out using the open trench method. Several areas required horizontal directional drilling and PROTECT pipes with a PP protective coating were used.

"This type of protective shell secures the pipes inside it and absorbs any mechanical and temperature impact (from –40°C to +40°C). This is very important for the severe continental Siberian climate," says Sergei Shelest, Director of Omsk Vodokanal. "Moreover, the pipeline withstands up to 16 bar whereas the operating pressure is no more than 8 bar."

CORSYS PRO SN 16 two-layer PP pipes with diameters of 315 mm and 630 mm were used for the construction of the 2100 mm storm water sewer.

The renovation works on Lenin Street are now successfully completed and road traffic has resumed.

Pic. 1. Chambers and drainage wells.

POLYETHYLENE PIPES PROVIDES SAVETY TO NUCLEAR POWER PLANT

Press-service of BELPOLYPLASTIC

A nuclear power plant is more than a reactor and a turbine spinning the generator; there are numerous auxiliary systems that ensure its safe, ongoing operation.

One of the major safety requirements is a large volume of water to cool the reactor and help maintain its stability.

Given the strict requirements for the reliability of water supply systems, PE 100 SDR 26 1200 x 45.9 pipes were chosen for use at the Belarus Nuclear Power Plant near Ostrovets.

The water supply system of a Nuclear Power Plant contains many high-tech components, as well as pipes; one of the most important is the system to discharge water into the drain wells.

It was initially planned to install about 50 cast iron flange outlets with diameters of 1200 mm and 400 mm branches to facilitate quick water discharge from the cooling system pipelines. This would have taken several days to install. It would also have required the addition of two flanges which would have had to be welded into the pipes, thereby increasing the chamber size. Moreover, the transition from one material to the other complicates the pipeline design process and can lead to potential risks.

Fortunately, BELPOLYPLASTIC specialists offered this effective solution to simplify the process: Replace the cast iron outlets with tappings into the main 1200 mm PE pipe using a Georg Fischer Piping System large diameter electrofusion saddle, together with a BELPOLYPLASIC 45° PE elbow.

Supervised by the BELPOLYPLASTIC Service Centre specialists, the contractors installed the saddle connection for water discharge into the drainage wells.

Pic. 2. Saddle positioning onto the pipes

The branch production schedule works like this:
- clean and mark the pipe at the assumed connection point;
- install the special frame into the tapping point;
- peel away the oxidation layer that prevents electrofusion welding from the main 1200 mm pipe using special tools;
- position the saddle and press it onto the pipe with sufficient force to minimise the gaps between the saddle and the pipe;
- weld the saddle to the pipe using a Georg Fischer MSA 400 Plus electrofusion welding machine;
- install the hole-drilling unit to make the hole inside the saddle's branch connection;
- drill the pipe and remove the drilling tool;
- weld the saddle branch pipe with a connection element using electrofusion coupling;
- install and connect the valve with a dismantling joint, then connect the 400 mm pipes to the drainage wells.

The works took place in previously installed concrete chambers, and were complicated by the fact that some sections of the pipeline had water in them. A test hole was drilled to drain the remaining water, before the main hole was drilled inside the saddle branch.

The application of electrofusion fittings and PE products was found to be best solution, both technically and financially.

Pic. 3. Completed branch

TONY RADOSZEWSKI

The Plastics Pipe Institute Inc. (PPI), headquartered in Irving, Texas, is the major trade association representing all segments of the plastics piping industry. More than 150 PPI members share a common interest in broadening awareness and creating opportunities that expand market share and extend the use of plastics pipe in all its many applications. As an association, PPI focuses collaborative efforts to accumulate data, concentrate facts and target resources toward advancements in applications and increases in widespread usage.
Since 2006, the Plastics Pipe Institute is headed by its president, Tony Radoszewski

– Mr. Radoszewski, how did you come to plastic pipe industry? What affected this decision? What made the main influence?

– I graduated with my degree in chemistry in 1980 and went to work for Phillips Petroleum Company selling polyethylene and polypropylene resins. In 1992 I became a sales manager for their polyethylene pipe subsidiary, Driscopipe, which is now known as Performance Pipe. In 1995, I went to work for Advanced Drainage Systems, the largest manufacturer of corrugated HDPE pipe, as director of marketing and business development. In 2002, I was named president of Wentworth Group International, a marketing and business consulting company. From there I was recruited to head the Plastics Pipe Institute in 2006. Looking back, I just think the people one interfaces with in the plastic pipe industry are solid, down-to-earth people working to improve society by bringing life's essentials (water, gas, electricity and communications) to more and more people around the world. And plastics offer the most sustainable option!

– What do you think was your major challenge and major achievement in the industry?

– When I was with Advanced Drainage Systems, their brand is a green stripe along the length of the corrugated drainage pipe. One of the challenges the president of the company gave me was to resurrect the brand. We conducted some market research and found that engineers and contractors were aware of the brand (the green stripe) but did not have an emotional attachment to it (critical when developing a brand) as it was not promoted or supported. So I put together a program to "reinvent" this corporate brand and was fortunate to have a boss who believed it was the right thing to do. We incorporated the green stripe in all of our literature, in advertisements, on the side of delivery trucks… everywhere we could think of to get it in front of our customers and to attach an idea of quality products and quality service. After a few years, the "Green Stripe" had been revived and the reputation of the company and its products were strengthened.

– Have you been involved with any "dead end" projects that were not completed? Were any of them wrongly forgotten?

– Yes, but not in the pipe business. When I worked for Phillips Petroleum, there was a strong desire to increase market share in the blown/cast film business. While we had some good resins for these applications, we didn't have great resins. We were successful in increasing the awareness and market share of these resins but just did not have what the market place was looking for to realize significant growth. I learned a lot about catalyst technology and the dynamics of a competitive marketplace but we just weren't successful in moving the needle to increase our sales significantly.

– What changes have you seen in the world market of plastic pipe systems while working in the industry?

– I think the ability to make larger and larger diameter plastic pipe, both pressure (solid wall) and gravity flow (profile wall) created a greater awareness of the engineering capabilities of plastics in pipe applications. It wasn't really too long ago that pipe diameters of 1000 or 1200 mm was considered cutting edge. Now pipes are being routinely made in 2000 and 2500 mm, extruded directly into the water and shipped across the Atlantic Ocean by tug boats! Just imagine what we will see in the next generation!

– What was the Global Financial Crisis affect (negative and positive) on the plastics pipe industry?

– Like almost every industry, the plastic pipe market was hurt in 2009, especially in the markets that serve residential housing. In the US, PVC pipe is mostly used in water and sewer systems and was devastated by the housing bubble seeing sales drop by nearly 50%. Now, some six years later, we are finally getting closer to a full recovery. However, the same was not true for HDPE pipe. In 2010, we saw a significant rebound in sales of HDPE pipe; not to the 2008 level but significantly stronger than 2009. Part of the reason is that HDPE pipe is used in more varied applications and this diversity helps when one industry is affected more than another. Most significant, however, was the dramatic impact of hydraulic fracturing in the oil and gas market. HDPE pipe is used to move water to and from the wells and of course to move the hydrocarbons (both oil and gas). As a result, 2011 was a record year along with 2012, 2013 and 2014. With the drop in oil starting in late 2014, we are not expecting a record year for HDPE pipe in 2015 but also not a horrible year due to other applications improving such as gas distribution and municipal water and sewer due to replacement of aging underground infrastructure.

– What do you think about the future dynamics of the world market of plastic pipe systems?

– The word is getting out to many more design engineers that plastics can and do outperform the more traditional, or "legacy" materials such as metal and concrete. As more and more younger designers make their way up the ladder they are looking at varying solutions to old problems and plastic pipes are absolutely the best answer. Continuing improvement in catalyst technologies and manufacturing equipment will continue to push the limit on where and how plastics can be used in pipe. Sometimes I wish I was a young man again just to see where our industry will be in the next 50 years!

– Which new developments in products, materials and technologies might impact the future of plastics pipe industry tomorrow?

– I think the advent of multilayer and composite pipe structures will have a significant impact on plastic pipe. By incorporating glass or carbon fiber or steel with plastics, the range of pressures has increased significantly opening new applications. We are now seeing plastic pipe systems that can operate up to 200+ bar allowing plastics to compete in industries where only steel was used before. Multilayer structures will take advantage of specific properties of different polymers that can improve abrasion resistance, chemical resistance, thermal stability and other properties allowing broader applications for plastic pipe. I also believe these "application specific" pipe structures will be more financially beneficial to pipe manufacturers which helps balance the more commodity uses.

– What are the world trends in plastic pipe industry?

– Even though plastic pipe was first introduced in the early 1950's with PVC and the 1960's with HDPE, these materials are still considered "new" as compared to ductile iron, steel, copper, clay and concrete. So we must constantly educate design engineers, students, elected officials and others to the superior performance and economic characteristics of plastic pipe. That is best done through educational seminars like the Plastics Pipe Conferences held every two years (the next being in Berlin in 2016), in regional conferences like the one in Moscow in 2013 and of course through case studies and articles in various trade magazines. The more we can get the message out to decision makers and influencers (and young people!), the better our opportunities to grow the use of plastic pipe. The trend is education, education and more education!

– Can you, please, say a few words directly to our readers, Russian Pipe industry professionals?

– I had the great opportunity to visit both Moscow and St. Petersburg with my wife in 2013 and both are dynamic cities. While there, we both enjoyed the culture, architecture, food and hospitality of the Russian people. Although my wife may not have been excited (!), I was quite happy to see a lot of replacement of old ductile iron, and even clay pipe, with plastic pipe. It's great to see that major world centers like Moscow and St. Petersburg recognize the advancements made in plastic pipe and install the better long-term performing option.

– In the addition – several questions for the form of Marcel Prust. What is your hobby?

– I like to play golf and brew beer. I used to run marathons but now I'm getting too old. My mind says I can still do the long training necessary but my body constantly overrules it. I think that's why I brew beer – both mind and body are in agreement on that hobby!

– What is your main feature of character?

– I like to think I am a very optimistic person. But then I think everyone in the plastic pipe industry is by nature optimistic!

– Where would you like to live?

– There are so many beautiful places to live in the world and I have been fortunate to have visited many so this is a very difficult question. I do like being in the outdoors where I can ride a bike, or hike so maybe where there are mountains fits more my style than say the beach and the ocean. Having grown up where it gets very cold (Wisconsin), I prefer more temperate or warmer climates. So Texas, where we live now, is a good place. Some people say that Texas gets very hot, and that it true especially in August and September. My reply to that is, yes it is hot but you don't have to shovel heat!

– Who are your favorite writers?

– When I was a young boy, I loved reading science fiction and Isaac Asimov was one of my favorite authors. When I graduated from college and had my first job in sales, one of my favorite books at the time (and still today) is titled "The Greatest Salesman in the World" by Og Mandino. Today, I think my interests are more in the line of theology. Maybe that's because now I'm on the backside of life and I better get straight with The Almighty before it's too late!

– Who are your favorite poets?

– So this is somewhat embarrassing, as I am not a big reader of poetry. While in college I studied the likes of Wadsworth Longfellow, Poe and others. But maybe it's since I had children that the most poetry I ever read was written by Dr. Seuss!

– Who are your favorite artists and composers?

– Monet and Renoir are my favorite artists and Chopin is my favorite composer. I really enjoy impressionist art and I admire that the artists of this movement took very big risks by creating a whole new style of painting. It's rare when an artist can be financially successful (while alive!) yet Monet and Renoir both achieved significant wealth. To me, that means they understood their customers and gave them what they wanted. As far as Chopin is concerned, well he was Polish as am I (at least by heritage) and I play the piano (although not so well!). Chopin's waltzes, nocturnes and polonaises are just lovely. My favorites are the Waltz in C# Minor and the Nocturne in C# Minor. One I could play and the other not at all. I'll leave it to your readers to guess which one is which!

– Who are your favorite personages?

– I most admire those people who looked at the status quo and made bold moves. Henry Ford's contribution to making the automobile affordable to so many people is a great example of understanding engineering, manufacturing and economics. Steve Jobs is perhaps the most recent person who exemplifies this philosophy as well. Yet he did Ford one better – legend has it that Ford said his customers could have any color car – as long as it was black! Jobs really understood design and created not only functional computers, phones, laptops and tablets but also near works of art. Design was very important to him and it shows by how much those products are emulated today.

– What is your favorite dish and drink?

– My favorite drink is an ice cold gin martini, with Beefeaters Gin and olives. However, I must admit, when I travelled to Russia in 2013, I enjoyed some very good vodkas! Russian Standard Platinum, served ice cold in a frozen short glass is my favorite. Then of course, there is the Polish Chopin which I really enjoy as well. Since I live in Texas, steaks are always on the top of my list but growing up I love a good Borscht that my Buszia (grandmother) made, with potato dumplings. Yum!

– Which historical personages arouse antipathy?

– I must classify this answer in a broad way because there have been so many tyrants throughout history. Simply put, those individuals (kings, emperors, sultans, etc.) who crushed the will of the people by enslaving them, taking away their simple liberties to enjoy life and persecuting them perhaps due to their ancestry or their religious/philosophical beliefs.

– What is the condition of your spirit in nowadays?

– Quite excellent, actually! Two of our three sons are out of college and the third is starting his junior year. So my wife and I are what's called in the US "Empty Nesters." While we certainly miss having them around the house, it does give us a chance to spend more time with each other, especially traveling. She said she is ready to come back to St. Petersburg!

– What is your favorite aphorism?

– "How old would you be if you didn't know how old you are?"

– If the devil offer you the immortality, would you agree?

– Of course not! Immortality insists that I am relegated to life on Earth! I am looking for eternal life in Heaven! Of course that does mean I have to lead a good life, of which I am trying (very hard!!!) to do!