Dear Colleagues,

We are proud to present the second issue of the annual digest of the "Plastic Pipe Journal" in English. It comprises the most interesting articles published in our journal in 2013 and the beginning of 2014.

You will find information on the most significant events that have taken place in the Russian and CIS plastic pipe industry within the past year, on the important achievements and market development tendencies, as well as on various interesting projects involving the use of plastic pipes.

Despite all the difficulties it encounters, the Russian plastic pipe market continues to evolve following the European and world experience in some aspects and taking a different, independent path in others. The Russian plastic pipe industry is rapidly integrating into the world market, not only as a large consumer of materials, equipment and technologies, but also as an active participant of processes of technological innovation and development of international standards. The actual consolidation of leading Russian market participants with European pipe companies has now commenced. The international conference Plastic Pipes 2013 held in Moscow and the increasing interest of European consumers towards Russian pipe innovations are just another confirmation of the fact that Russia has become a rightful participant of the global plastic pipe market.

We endeavor to objectively cover the events that are currently taking place in our intensive, roomy, volatile, often not predictable, but increasingly dynamic and very promising market. We hope that our journal, so far the only one in the industry, will help you to understand the Russian plastic pipe market better and to feel more confident while finding effective ways and means of collaborating with Russian partners. Ultimately, this will lead our readers to success and the Russian/CIS plastic pipe market to further development and prosperity.

Miron Gorilovskiy,
Editor-in-chief

PLASTIC PIPES
Annual information and analytical digest

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INDUSTRY NEWS

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POLYPLASTIC GROUP

NOVOMOSKOVSK PIPE PLANT JOINS POLYPLASTIC GROUP

Press service of POLYPLASTIC Group

The POLYPLASTIC Group keeps expanding. Novomoskovsk Pipe Plant, established in 2006 by the Polymer Managing Company and Kazanorgsintez CJSC (at Polymercontainer Novomoskovsk Plant) joined the Group in the first half of 2013.

Novomoskovsk Pipe Plant has 9 extrusion lines with a total capacity over 20,000 tonnes per year. The plant can produce PE pipes from 20 mm to 630 mm, and has its own testing laboratory to implement quality control of all products.

The plant will increase production capacity 1.5–2 times within the next five years, helping to capitalise on its great potential. Moreover, the product range will include innovative pipes developed by POLYPLASTIC Group.

The plant has a lot of production and warehouse space, and the 15+ hectare site will be expanded still further. Power availability is 3–4 times higher than current consumption.

Full scale modernisation will start in the near future. The aim is to deploy PVC suspension pipe production. The POLYPLASTIC Group plans to bring new PVC pipe products for water and sewer pipelines from 110 mm to 500 mm as well as casings for the Russian market by 2014.

In the next two years the plant plans to implement the production of high pressure oriented PVC pipes and will become the largest producer of PVC pipe in the FSU region.

The addition of the Novomoskovsk Pipe Plant is consistent with the Group's strategies of doubling sales volume by 2020, and of achieving production output of 500,000 tonnes per year. In this case, given the state of the pipe market, the PVC share should be not less than 12–15% (60–75 thousand tonnes). The mutually beneficial effects of the merger will be seen in the accelerated development of the plant, expansion of its production facility, and widening of the product range and sales volumes, as well as the reinforcement of the POLYPLASTIC Group's position on the pipe market in Russia and the FSU region.

IMPORT OF PIPE GRADE PE HAS FALLEN 50% IN 2013

According to the DataScope Review of Market Report, imports of HDPE into Russia in 2013 have reduced by 30%. This is due to a domestic production increase of 38% and the slowing dynamics of demand growth.

The total volume of HDPE imported into Russia in 2013 has fallen to 286.2 thousand tonnes compared with 408.5 thousand tonnes in 2012. Import growth was only reported in extrusion coatings for big diameter steel pipes and the injection molding sector. The overall import indicator in these sectors came up to 73.8 thousand tonnes and 48.9 thousand tonnes respectively. That is 12% and 3% more than in 2012.

Imports of HDPE for pipe production gave fallen by almost half in 2013. It reached 68.3 thousand tonnes (129.6 thousand tonnes in 2012). Reduced demand for PE pipes in the internal market and high prices for HDPE has made Russian processors significantly reduce imports of raw materials.

Imports of film grades of HDPE have fallen by more than half in the last year and reached 44.8 thousand tonnes (about 1000 thousand tonnes in 2012).

The main reason for such a significant reduction in imports was domestic production growth. Imports of blow and cable HDPE in 2013 contracted to 30% and 10% respectively – about 34.2 thousand tonnes and 13.6 thousand tonnes.

Source: advis.ru

ROSVODOKANAL AND POLYPLASTIC GROUP HAVE AGREED ON LONG-TERM COOPERATION

On 17 April 2013 Miron Gorilovskiy, President of the POLYPLASTIC Group, and Alexander Shenkman, President of the ROSVODOKANAL Group, signed an agreement during the All-Russian Water Companies Congress in Ekaterinburg.

The agreement defines the key conditions of a long-term cooperation and strategic partnership to construct water and wastewater pipelines using the most modern pipeline systems.

Sourse: sts-ural.ru

SMUGGLERS ARE USING HORIZONTAL DIRECTIONAL DRILLING METHODS

It's easy to assume that most boreholes made using the horizontal directional drilling method are in rural areas, far from onlookers and close to the borders of the former Soviet Union. Just as it's easy to assume they're not being used for communication construction in the big cities.

Investigators from the Security Services of Ukraine and Border Control have revealed that 300 metres of illegal underground pipeline were built from Russia to the Ukraine, in Krasnodarskiy Village, Lugansk Region. They also found a base with storage tanks for diesel and pumping equipment.

The investigators stepped in before the equipment could be used.

The illegal pipeline was destroyed by excavators. The pump and storage tanks were handed to the Customs department, who are now trying to establish who was involved in the illegal transportation of diesel.

Just in the Lugansk region alone, 29 illegal fuel transportation pipelines were destroyed in 2013.

Illegal pipelines aren't just built for fuel transportation though. They have been used for transporting spirits at the border between Ukraine and Moldova. According to the State Border Service of Ukraine, investigators have revealed and destroyed six spirit transportation pipelines at the border within the last two years.

In March 2012, a pipeline for spirit transportation was stopped at the state border in the Odessa region. Smugglers used an underground pipeline from Novokotovsk Transdniestrian village to Pavlovka Village, Odessa Region. The approximate length of the pipeline was 3.5 km, with a depth from 0.5 to 2 metres.

Allegedly, a 50 mm pipeline was built in 2011 and was concealed with bulrushes in Ukraine.

The Public Relations and Media Department of the State Borders Control of Kyrgyzstan has reported another pipeline at Kazakh-Kyrgyz Border, which was used to illegally transport spirits from Kazakhstan to Kyrgyzstan. The pipeline was 500 metres long with diameter of 160 mm.

Sourses: gnb-blog.com.ua, eastkorr.net, 24kg.org, dpsu.gov.ua

POLYPLASTIC GROUP
IS 264TH OUT OF RUSSIA'S 400 LARGEST COMPANIES

The Expert RA Rating Agency, in conjunction with Expert Magazine, have published Expert-400, their 19th rating of Russia's largest companies. The top five leaders have remained largely unchanged: Gazprom, LUKOIL Oil Company, Rosneft and Russian Railways topped the rating while Sberbank has made a return to 5th place.

The total revenue of Russia's top 400 largest companies in 2012 was 1 trillion, 475 billion US Dollars. This is the highest figure in Expert-400 history.

However, leaving aside the data from 2009 (when the global crisis was at its height), the growth increment of domestic business leaders was only 10.4 %, a record low in the history of the rating.

"High oil prices do not influence the revenue growth any longer. The current dynamics of capital investment in Russian companies tends to zero. This indicator was 8.3 % in 2011, 6.6% in 2012 and based on 7 months' figures of 2013, it has fallen to 2.5%. Stagnation is inevitable without new investment reserves," according to Fedor Zherdev, Head of Industrial Policy Department of Expert RA. He goes on to say, "It is most likely, the growth dynamics of Russia's leading companies will decline at least two times. We estimate the total revenue of the companies in 2013 to be around 1.5 trillion US Dollars".

The POLYPLASTIC Group went up eight positions into 264th place. Sales volume (PE pipes, and fittings, engineering plastics) for the last year exceeded 27 billion rubles – that's 17.5% higher than in 2011. Pre-tax profit was 1322 million rubles in 2012, net profit – 984.5 million rubles.

More details on the ratings can be obtained from the Expert RA website: raexpert.ru/ratings/expert400/2013.

Press Service of POLYPLASTIC Group

FORBES
PUBLISHES LATEST TOP 200 RESULTS

Forbes has published its latest list of Russia's Top 200 largest private companies. The list is based on reported revenue for the year 2012 in accord with IFRS standards and only includes companies with no more than 50% of government and foreign capital.

The list doesn't include banks, insurance, leasing, investment and other finance companies due to their substantial business and accounting distinctions from trade and industrial companies. Moreover, the rating does not contain asset management companies, but does include the companies they manage.

Unlike previous years' lists, the 2012 rating includes public companies listed on the stock market, 56 out of 200 companies. Consequently, the results are not comparable with the previous lists that concentrated on non-public companies only. The position of the company on the list does not reflect its results on the market.

POLYPLASTIC Group was in 174th place with 27 billion rubles revenue in 2012. Sale proceeds growth was 4 billion rubles (14.5%) compared to 2011. The Group dropped 51 positions, but rose 8 positions amongst non-public companies.

LUKOIL tops the rating with 3.6 trillion rubles. Surgutneftegaz comes second with 850 billion rubles. Russian mobile operator Beeline (from VimpelCom) is third with 717 billion rubles.

The total revenue of Russian top 200 largest private companies was 22.9 trillion rubles.

Sourse: forbes.ru

RADIUS REACHES RUSSIA

Tatiana Chekanova

Since November 2013, Radius Systems electrofusion fittings have become available on the Russian market. This is a very well respected brand from the European producer. Radius Systems Ltd is the leader of the British market and the major supplier of electrofusion fittings to British Gas.

Electrofusion fittings: couplers up to 315 mm, reducers up to 250 mm and elbows and tees up to 180 mm are available in Russia. The fittings come with 4 mm pins (which are common in Russia) for welding with any electrofusion machines. Radius fittings are distinguishable by visible wires.

Extensive work has been done to secure full approval for Radius fittings in Russia, including a technical data sheet in Russian and a full range of regulatory documentation (a GOST certificate comprising approval for use in the gas industry and official registration for drinking water). Marking of fittings on the packaging is in Russian and includes bar codes for product scanning and welding parameters for manual input.

The POLYPLASTIC Group intends to continue its successful cooperation with Georg Fischer Piping Systems, its strategic partner with a similar range of products. The Group also aims to enhance its competitiveness in the economy segment by promoting its own products (Radius Systems has been a part of the POLYPLASTIC Group since 2012) and widening its range of electrofusion fittings. The price of Radius fittings will be 15–20% lower than its premium Swiss equivalent. This will give customers more options, not only when they opt for open or closed wiring, but also when choosing premium or economy brands.

The most popular Radius products are scheduled for production at the Klimovsk Pipe Plant in 2014.

OMSK PIPE PLANT INCREASES PRODUCTION

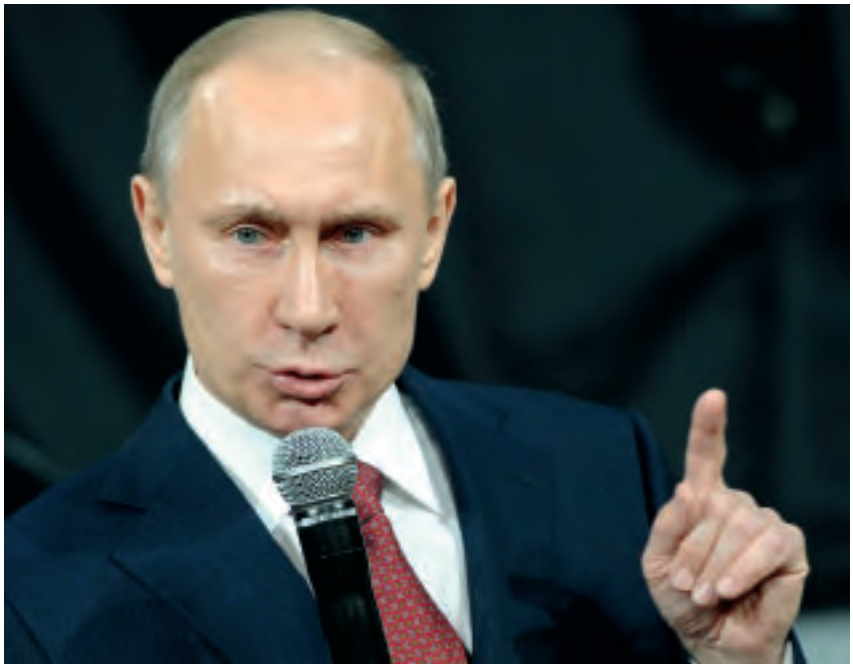
The Omsk Pipe Plant (OZTI), part of the POLYPLASTIC Group since January 2012, has increased its production output to 14.6 thousand tonnes, a 50% increase on 2011.

Staff numbers at the Omsk Pipe Plant rose to 379 in February 2013 – a 21% increase on February 2011. Labour efficiency increased by 66% thanks to higher production growth.

The average wages at OZTI in the second half of 2012 increased to 23.3 thousands rubles per month – 37% higher than the average wages in the first quarter of 2011 (18.5 thousand rubles).

OZTI aimed to produce 19 thousand tonnes of pipe products by the end of 2013, doubling their production output since joining the POLYPLASTIC Group.

Press Centre of POLYPLASTIC Group



IT'S TIME FOR COMPULSORY USE OF PLASTIC PIPES IN INFRASTRUCTURE

The opening ceremony of Tobolsk Polymer, one of the largest polypropylene production plants in the world, took place on 15 October 2013 in Tobolsk, attended by President Vladimir Putin. The construction of the new plant represents the largest investment project in the Russian petrochemical industry.

Alexander Novak, Energy Minister of the Russian Federation; Vladimir Yakushev, Governor of the Tyumen Region; Leonid Mikhelson, SIBUR Holding Chairman of the Board of Directors and CEO of Novatek OJSC; Alexander Dyukov, General Director of Gazprom Neft OJSC and SIBUR Holding Deputy Chair of the Board of Directors; and Dmitriy Konov, General Director of SIBUR took part in the ceremony.

Panel discussions on the development of the petrochemical industry were chaired by Vladimir Putin. In his speech, the Head of State highlighted a number of problems holding back the development of the industry. He observed that consumption of petrochemical products in Russia is several times lower than in developed countries, saying, "We need to form and expand our national market, create incentives for widespread use of modern polymeric materials".

The President also stated, "We need to create incentives to avoid exporting raw materials and process them here, in Russia; and produce ready goods for the internal and export markets with high added value abroad".

Vladimir Putin highlighted the need for sensible customs tariff regulations, which can "completely and effectively use all competitive advantages and develop domestic petrochemical production".

The President also pointed out that "It is necessary to create and master new markets and widen the range of products". He expressed his readiness to order the Government of the Russian Federation to amend the existing regulations to extend the use of modern plastic materials. "By this I principally mean the creation of new standards, and the amendment of the existing state standards, construction codes of practice, and technical regulations, with the inclusion of clear requirements and responsibilities of implementation for modern petrochemical products with quality properties", stated the President.

The President also commented on the speech of Denis Manturov, Head of the Ministry of Industry and Trade, who pointed out that his department has drafted a new initiative standardisation law. The President agreed that the use of new technologies and polymeric materials should be compulsory. "We have to make sure these measures are implemented, as standard, because if there is no obligation to use certain technologies or materials, we will keep doing things the same old way", said the President.

Source: kremlin.ru

BUDENNOVSK: ANOTHER FIRE AT STAVROLEN

A fire broke out on 26 February at the ethylene gas separation unit at Stavrolen in Budennovsk.

15 people suffered a range of injuries and multiple burns. Four were taken to hospital and the remainder were treated locally. The fire was put out several hours later.

Production was stopped as a result of the emergency. The cause and nature of the fire, the scale of the damage and a plan for the return to production will be determined after an investigation of the special committee involving Government supervision authorities.

A criminal investigation has also been launched to assess the violation of health and safety rules at a dangerously explosive facility.

Stavrolen (part of LUKOIL) is the second largest HDPE producer in Russia after Kazanorgsintez and third in PP production output after Nizhnekamskneftekhim and Tomskneftekhim.

According to Vladimir Kapustin, General Director of VNIPIneft, LUKOIL will need about a year to restore production at Stavrolen.

Stavrolen previously had an emergency in December 2011 which stopped production as a result. On that occasion, Stavrolen restored PP production by temporariily purchasing raw materials from Karpatneftekhim (part of LUKOIL) and a number of other Russian producers. The pyrolysis unit was launched at the end of September.

Source: Interfax, rupec.ru

POLYPLASTIC AND BASF SIGN A STRATEGIC COOPERATION AGREEMENT

Press service of POLYPLASTIC Group

POLYPLASTIC Group and BASF have signed a Strategic Cooperation Agreement on the development of innovative compound stabilisation systems for the car industry.

The document was signed by Miron Gorilovskiy, President of POLYPLASTIC Group and Sergey Andreev, Head of BASF Representation Office in Russia and CIS countries.

Both companies plan to actively participate in the implementation of joint projects aiming to improve the quality of POLYPLASTIC products and compliance with international standards, and widen the range of compounds available for car industry projects. BASF will develop and supply POLYPLASTIC Group's stabilisation systems – antioxidants and light stabilisers which protect polymers from damage caused by temperature, mechanical impact, light and other exposure.

"The goal of cooperation is, first of all, to create a team of managers and research scientists to develop innovative materials and modern technologies that comply with advanced car industry manufacturing and ensure a responsible approach to the environment. We have no doubt that the cooperation of POLYPLASTIC and BASF can solve the difficult task related to the stabilisation properties of polymers during operation, and raise the competitiveness of Russian composite materials," said M. Gorilovskiy at the end of the ceremony.

In response S. Andreev said: "As a part of the new BASF strategy in Russia and CIS markets, the company is intending to expand its presence in the region through cooperation projects with its partners. We believe that cooperation with POLYPLASTIC will further enhance their success in the localisation of compounds production and support the development of the car industry in Russia and CIS countries."

The agreement between the companies was signed during the Interplastica 2014 exhibition.

ROSVODOKANAL'S FIRST TECHNOLOGY FORUM

Dmitry Shapkarin

ROSVODOKANAL's first technology forum for Russian and foreign water supply and disposal equipment suppliers was held on 23–24 August 2013 in Orenburg. Suppliers and contractors from the industrial centres of Russia and foreign technology companies presented a full range of equipment and services for the modern high-performance water supply and disposal industry.

ROSVODOKANAL is carrying out a full-scale utilities modernisation programme in Orenburg, Voronezh, Tver, Krasnodar, Omsk, Barnaul, and Tyumen with over 15.5 billion rubles of investments. The implementation of new technologies and best international practice are the major drivers of effective solutions.

"The technology forum gives the chance of direct dialogue with a wide range of equipment suppliers, some of which are industry leaders, and are well-known globally. Our goal is to completely switch to top quality equipment with a minimum service-life of 50 years. Partnership with the leading suppliers will help to achieve this goal", said Stanislav Khramenkov, Technical Director of ROSVODOKANAL.

POLYPLASTIC Group has represented PE pipes producers. Recent acquisition of Subterra, the leader of trenchless pipe rehabilitation technologies, offers top-level integrated solutions to the customers.

The exhibition was held at the Orenburg Vodokanal training ground where participants demonstrated their products.

POLYPLASTIC Group products inspired great interest, particularly the

multi-layer pipes which have become widespread throughout Europe. The POLYPLASTIC Group successfully implements forward-looking practices and is the only company in Russia to produce multi-layer pipes on an industrial scale.

Specialists from the POLYPLASTIC Group made a multi-layer PE pipe welding demonstration and answered questions from industry professionals.

One interesting episode during the demonstration really surprised the audience... The newest heavy-duty motor saw, designed for reinforced concrete and cast-iron pipes (with a special chain and a water jet at the cutting area) was unable to cut through Multipipe II made of PE 100RC. The saw chain just slipped on the pipe leaving slight scratches, despite all the best efforts of the operator, who had previously been cutting through tough reinforced concrete blocks, steel and cast-iron with ease.

A skills competition for utility industry professionals was held during the Forum. 150 participants from 7 teams demonstrating their high-level professional skills in emergency repair and installation works. The only significant disadvantage of the competition was the absence of any modern plastic pipes and fittings. The specialists from the POLYPLASTIC Group will update the programme accordingly for future contestants.

YEAR BY YEAR...

Press service of POLYPLASTIC Group

The Annual convention of POLYPLASTIC Group Pipe Division subsidiaries was held from 31 January to 2 February at the Sheraton Moscow Sheremetyevo Airport Hotel. Over 80 executives from the POLYPLASTIC Group managing company, managers of commercial subsidiaries and divisions participated in the convention.

The convention was opened by M. Gorilovskiy, President of POLYPLASTIC Group who gave a briefing on the annual results, most of which were according to the plan. South and Ural divisions achieved outstanding results and the best sales results were achieved by Belarus. Ukraine, Kazakhstan and Volga subsidiaries have completed a very difficult 2013 with an average 20% underperformance. A slowdown (average –8% of estimated sales) was registered by POLYPLASTIC Siberia, POLYPLASTIC West Siberia, Cheboksary Pipe Plant and POLYPLASTIC Centre. Federal projects were seriously impacted due to a sharp reduction in the Gazprom gas distribution network development programme, completion works in Sochi, APEC and delays in oil and gas project financing.

As a result, average margins dropped significantly and accounts receivable increased at the end of the year, despite the achievement of general sales targets.

The POLYPLASTIC Group acquisition of Radius Systems was a positive moment and enabled the company to enter European markets. The president of the Group had made half of his speech in English to show that POLYPLASTIC Group has now become an international company.

M. Gorilovskiy briefly talked about foreign investment. Radius Systems has 44 years of history and is the market leader in the British PE pipes market, holding substantial market share in the gas, water supply, sewer and communication sectors. Radius Sys-

tems has a strong team of professionals, engineers and managers, headed by Andy Taylor. The Group can now rely on the successful promotion of its products in European markets.

Three more British companies with great potential – Subterra, AEON and Redman – were acquired as part of the Radius Systems management initiative. Their integration into the Group delivers synergies, facilitates product range expansion and strengthens the share of the Group in the world market.

M. Gorilovskiy pointed out that the Group will continue to determine, choose and acquire the best assets in Russia and abroad. Russian companies with a traditional range of pressure pipes; foreign companies producing high margin products with no equivalents in Russia; and companies that enable the promotion of technologies or pipe systems to be developed and successfully deployed in Russia (ISOPROFLEX, CORSYS, CORSYS ARM and others): will all be acquired.

Regarding prospects closer to home, the company President emphasised the need to capture market share in the domestic plumbing systems sector. He said that domestic plumbing accounts for about 50% of total plastic pipes sales in Europe. It is very important to develop this sector systematically and according to the plan. This is where the experience of the foreign colleagues will be needed.

K.Trusov, Head of the pipeline division, talked about major changes in the division. 2013 began with the official joining of Sibgasapparat Plant. The benefits of the annexation are obvious for both the plant – where production has been increased twice to a record level of 10,000 tonnes – and the Group – particularly POLYPLASTIC Ural, the regional company which significantly strengthened its position and expanded its presence. For more details see “Sibgazapparat: first results” on page 16.

Novomoskovsk Plastic Pipe Plant was bought in spring. The plant has regained general production recovery and has development prospects within the Group’s international projects. Production of PVC pressure and non-pressure pipes with diameters up to 500 mm will start very soon. The installation of four technology lines

imported from England with an annual capacity of 20,000 tonnes has been completed. Moreover, the production of rubber gaskets for CORSYS pipes is being evaluated.

The creation of the Arystan Trade House with its strong team was another organisational change. This step was taken as part of the development plan, and the expansion of the Group in the Kazakhstan market.

The decision to create the Trade House of Cheboksary Pipe Plant was taken at the end of the year to provide unification of the pipe division structure in the Group.

K.Trusov has presented the managers of the new companies and divisions to the participants.

The principals of the subsidiary companies also provided details of their achievements, problems and plans for 2014.

V. Buyanovkiy, Chairman of the Board of Directors of POLYPLASTIC Group, presented an analysis of production and finances for the Group in 2013, and explained the reasons for the reduction when compared to 2012. He pointed out that this had also happened in many other sectors.

In his opinion, the country is currently in stagflation with no economic growth and rapidly rising costs. Increased profitability is the only way out of this situation. V. Buyanovkiy outlined the measures necessary to achieve this difficult task.

Speaking about the major strategic challenges for the pipe division, V. Buyanovkiy named increasing profitability, increasing volumes to 400,000 tonnes by 2020, and the creation of a domestic pipe systems division with not less than 25% market share within the next the 5-years.

V. Buyanovkiy shared his forecast for 2014 and suggested that there were grounds for optimism. The depreciation of ruble will have a positive economic impact as it is based on energy prices. Taxable income will grow and the budget will increase. The American stock market is growing and the economic situation in Europe indicates that the Russian stock market will grow too. This will lead to the gradual restoration of liquidity in our finance market and we will see the signs of the U-turn by the end of the third quarter.

Moreover, there is a hope that the Government will tackle the problems of modernisation in housing and utilities, and will begin investing in the sector. All this will help to improve the results and achievements of the POLYPLASTIC GROUP in 2014.

RADIUS Systems

News

Ноябрь 2013 г.

REDMAN

RADIUS SYSTEMS ACQUIRES REDMAN FITTINGS BUSINESS

Radius Group, the UK's leading supplier of Polyethylene pipes and fittings to the Utilities sector, is pleased to announce that it has purchased the trade and assets of the Redman Fittings Ltd. business from Tricorn Group, the AIM listed tube manipulation specialist, for an undisclosed sum.

Redman produces innovative jointing systems for use typically within the utilities industry and as a result is a perfect complement to the Radius proposition. Redman patented fluid compression fittings providing a strong and simple joints with fast and effective installation process whatever the site conditions.

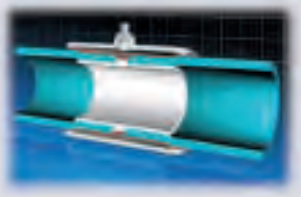
Andy Taylor, Radius CEO commented:

'Redman is our third bolt on acquisition this year since the POLYPLASTIC Group takeover in February and is a further commitment to growing the Radius brand. The brand and the product range fit well with our strategy to enhance our value added proposition to our customers and we are excited about the growth opportunity Redman brings to the Group for the UK and CIS activities'

POLYPLASTIC/POLYMERTEPLO/Radius Group *is the market leader in engineered polymer products in the CIS and the largest producer of polyethylene pipes and fittings in Europe. The Group is the market leader in polymer composite materials supply to the automotive, white goods and building materials sectors in the CIS where it is also the leading manufacturer of District Heating Solutions. The Group operates from 19 plants and exports to more than 50 countries worldwide has an annual turnover of c.€1bn and employs in excess of 7000 people. The combined Group is headquartered in Moscow. More details about the*

POLYPLASTIC/POLYMERTEPLO/Radius Group
can be found at:

www.polyplastic.ru
www.polymerteplo.ru
www.radius-systems.com



Poly Plastic
ГРУППА ПОЛИПЛАСТИК

SIBGAZAPPARAT: FIRST RESULTS

Oleg Kukharevich, Peter Titov

Over a year has passed since the Sibgazapparat Plant in Tyumen joined the POLYPLASTIC Group in December 2012.

The plant was founded in 1993 by Gazprom to develop and implement European knowledge and mass production processes for PE pipes and fittings used in the construction of gas pipelines.

Sibgazapparat was part of Zapsibgazprom. Following corporate restructuring, the plant experienced problems with raw materials supply. All modernisation programs were frozen, production volumes were decreased and staff were made redundant. For most of 2012, Sibgasapparat existed on tolling scheme sales orders from POLYPLASTIC Group. Vladimir Yakushev, Governor of the Tyumen Region, who visited the plant in February 2013 said, "The fate of the enterprise was quite clear without modernisation and investments."

The company joined POLYPLASTIC Group in December 2012. Some employees were concerned that the plant was bought "to eliminate a competitor from the market." The doubts vanished after POLYPLASTIC Group set serious strategic targets for Sibgazapparat, made investments and undertook repairs and modernisation of the enterprise.

One of the main tasks was to double the production volume: pipe production in 2013 was 10,000 tonnes. The plant met this target by 5 December 2013, its first anniversary as part of POLYPLASTIC Group, beating the record of the previous 10 years.

Roof of the production unit in June and in August 2013

The fittings molding shop began working to full capacity, operating two shifts. Production of CORSYS fittings, a new type of product, also began.

The PE-steel transition pieces production shop works at full capacity in one shift. The recycling shop was organised from scratch and worked in two shifts.

The name change of the plant required certification of the full range of products produced. This task was completed within a year.

However, the POLYPLASTIC Group plans for Sibgazaparat were not limited to the restoration of production volume – a large increase in capacity was also required. A significant amount of work has been underway to create conditions for further growth simultaneously with the increase in production volume.

The lack of power supply was a serious obstacle for further technical development of the plant and increasing production capacity. It was necessary to increase permittable power from 1.2 to 6.0 megawatt. Construction of a new distribution station and completion of the first stage of the power supply system modernisation in 2013 enabled an increase in permittable power supply to 3.0 megawatt. The plant will achieve its required 6.0 megawatt after Tumenenergo has completed the technical modernisation of its power utilities in 2014.

Significant increases in production volumes required fundamentally new approaches for product approval, storage and shipment. The project implementation required the construction of new roads and warehouses on site however this task was complicated by a number of geotechnical conditions such as high level ground water and ground frost-heaving in the winter. The expertise of the engineers in the Capital Construction Department of POLYPLASTIC was crucial to finding the solution. The effectiveness of these solutions has been proven in practice and the plant resumed operations using the new schedule in autumn 2013.

A modern fitting centre with 1,550 pallet positions was created to ensure prompt supply of fittings and equipment for pipeline installations.

Great attention was paid to refurbishing the premises and office buildings.

Large-scale roofing works have been carried out in the 11,520 square metre production unit. The leaking roof was causing enormous inconvenience during production and lead to the violation of health and safety rules. Refurbishing works eliminated these problems.

The construction of an administration building for the trade house and the plant, testing lab modernisation and a further upgrade of the warehouse is all planned for 2014.

Sibgazapparat has embarked on a new stage in the life of the company by joining POLYPLASTIC Group. The production of pipes has increase by 63% and production of fittings has tripled within the first year. In 2014, production of PE pipes for the water and gas industry – the main product line – will be increased by 40% and estimated to reach 14,000 tonnes.

In return, by acquiring a Tyumen enterprise, POLYPLASTIC Group has gained inarguable advantages including anchoring and expanding its presence in the region. For example, its regional POLYPLASTIC Ural representation office used to rely on supplies from the Omsk Pipe Plant, 1,000 km away from Ekaterinburg. It is now possible to significantly improve customer service for placing orders and production and reduce the lead time from three days to one (the distance between Tyumen and Ekaterinburg is only 400 km). Moreover, stock held has been doubled to 2,000 tonnes and the range of products extended. The new production of PE-steel transition pieces with the diameters up to 630 mm for the water and gas industry has extended the range of items and notably increased the sales. Previously, similar items were produced only for gas pipelines and with diameters up to 400 mm.

The changes at Sibgazapparat plant, and the results of the first year as part of the POLYPLASTIC Group, clearly demonstrate the mutual benefits of the alliance. Further development of the enterprise, and the implementation of new products, will pave the way to more effective work for the Group sales division and further social and economic development of the Ural and Western Siberia regions.

PLASTIC PIPES MARKET

ASSOCIATION FOR POLYMERIC MATERIAL WELDERS HAS BEEN FOUNDED

Elena Zaitseva
Director of APMW, Director of POLYPLASTIC GROUP Training Centre

It's impossible to slow the rapid rate of progress in the construction industry. The volume of polymeric materials use is increasing every year. New types of polymers, new pipe designs, new welding techniques for polymeric materials, and new approaches to the construction and renovation of the utility networks are all being devised. These

rapid developments must all be supported by appropriate regulations in pipeline installation, welding, quality control (of the joints), testing, commissioning and operations.

However, regulation in the construction industry lags behind comparable activity, particularly in the plastic pipelines industry, and especially for welding of large diameter pipes with profiled or thick walls. Another hitherto neglected subject in Russian construction legislation is the hot gas and extrusion welding (relating to welding sheets, tanks, films and membranes).

This is a very important issue given that the welding of polymeric materials and goods made of plastic is the last stage of the process. The success of the whole operation depends on the quality of the installation and welding. Unfortunately, incompetence in the polymeric materials, installation and welding processes, as well as lack of regulations, and a lack of qualified specialists all result in poorly executed projects and system failures, i.e. problems during operations. These factors can also lead to refusals from some of the most prospective construction areas, putting the plastic pipes industry in jeopardy.

Entry into the World Trade Organisation, and the impact of the Federal Law on Technical Regulation, both necessitate the creation of new Russian construction regulations (in accord with international legislation, particularly with European standards). Leading legislation organisations have concluded relevant contracts with a number of Western institutes and organisations and can use their expertise in creating new regulations. Therefore, authentic (identical), unified or modified standards can be created in the Russian Federation (see information below).

Currently, there is a Technical Committee, TC 364 "Welding and Related Processes", covering standardisation issues in welding, and subcommittee SC 12 "Welding and Gluing", covering polymeric materials. On 14 February 2012 the National Welding Control Agency (NAKS) and the German Welding Society (DVS) signed an agreement on standardisation. The agreement allows drafting of Russian national standards in polymers welding, based on the DVS regulations. It should be noted that Germany has meticulously addressed all subjects related

FOR INFORMATION

Standardisation is based on the latest achievements in science, technology and practical use, and determines progressive and economically sound solutions for the national economy, industry and production tasks. It encourages the strength and purposefulness of new scientific achievements, and enhances practical use by uniting technologies and expertise.

Standardisation creates organisational and technical grounds for quality products. The increased specialisation and cooperation helps to self-regulate the industry.

Harmonisation of standards – adjustment of the content in line with other standards to ensure product (service) substitution, as well as common understanding of test results and the information contained in the standard.

Harmonised (or equivalent) standards can contain some differences: in sense, notes, some special instructions etc. There are related definitions "Identical standards" and "Unified standards".

Identical standards – harmonised standards that are completely identical in content and form. It is often an exact translation of the standard (international, regional) accepted in the national standardization system. They may have difference in identification (marks and codes).

Unified standards – harmonised standards that are identical in content but differ in presentation form.

Modified standards – standards containing an authentic text of international standard with additions and amendments related to specific nature of the national economy of the Russian Federation.

to the construction of pipelines and other structures made of plastic materials, including the welding and gluing of polymers, and the qualifications of relevant personnel.

However, a detailed study of the experience of our colleagues in the west has shown that not all Western standards are applicable to our conditions. Some issues are absent, not addressed, or unacceptable for our mindset. For example, welding big diameter pipes with wall thicknesses over 70 mm; quality control governing legally acceptable methods for welding gas pipes over 315 mm; welding modes for pipes and sheets at temperatures below 0°C; appropriate welding modes for pipes with different melt flow index etc.

Attempted breakthroughs in the technical regulation of welding plastic materials have been controversial. It has become obvious that this issue cannot be entirely resolved by single market representatives and / or the welding society.

In April 2013 a foundation meeting of the Association for Plastic Material Welders (APMW) was held after six months of consultations and joint preliminary work by representatives from Russia's leading companies and specialists.

The Association was founded by 12 legal entities and six individuals. Members include leading specialists of the polymeric industry including Professor Vladimir Kimelblat, D.Eng.Sc; Vladimir Bukhin, Professor German Komarov, D.Eng.Sc; Vladimir Pavlov and others.

The National Welding Control Agency has played an active role in creating the Association; the organisation deals with technical regulation of welding according to TC 364 "Welding and allied processes".

The Association for Plastic Material Welders has been created to consolidate and coordinate members involved with the welding of plastic materials, to ensure compliance with the main requirements: technical level and methodology, standardisation, marketing, PR and press.

Their mission is as follows:

– The Association initiates and facilitates development and approval of regulatory documents aimed at developing the plastic materials industry in Russia, with regard to quality and safety of products.

– The Association works closely with the National Welding Control Agency and coordinates SC 12 "Welding and gluing of polymers" in TC 364 "Welding and allied processes".

– The Association coordinates its activity with other Russian and foreign industry organisations and research institutes.

– The Association ensures joint participation of its members in developing best practice in personnel training for everyone involved in polymeric material welding.

– The Association develops and submits recommendations to relevant Governmental bodies on industry strategy in Russia and allied industries.

– The Association forms a professional information pool encouraging business dialogue between its members.

The Association for Plastic Material Welders supports the following groups:

– Russian and CIS (Customs Union countries) producers and suppliers of welding equipment.

– Producers and suppliers of polymeric material goods (pipes, fittings, valves, sheets, plates, membranes and others).

– Producers of tanks and reservoirs, galvanised lines and equipment, industrial ventilation systems, communication and sewer manholes, pumping stations, vessels and other engineering plastics products.

– Dealers and distributors of polymeric products and welding equipment, service companies using plastics with different methods of welding (consumers).

This consolidation of specialists has become possible thanks to the POLYPLASTIC Group providing its material and technical base, its laboratories and research facilities. Most construction and commercial companies understand the importance of welding regulations and have expressed their wish to work in the following areas:

– Welding of plastic materials. Terminology, definitions, notation

– Welding of plastic pipes using butt-fusion equipment

– Electrofusion joining

– Socket joints welding

– Extrusion welding

– Hot gas welding using additives

– Creation of professional standards, training methods and qualification tests for personnel

– Equipment for thermoplastic pipes and sheets welding. Classification and General requirements

– Welded joints quality control methods

The formation of a regulatory base for plastics welding looks set to attract attention from specialists in related industries such as gas distribution, water supply, as well as companies using industrial pipelines, and users of geomembranes, plastic sheets and films etc. Therefore, the creation of this professional association is a very important (and well-timed) step towards the development of improved plastics welding technologies.

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NEW TECHNOLOGIES ARE THE SOLUTION TO HOUSING AND UTILITIES PROBLEMS

Press office of the Government of Russian Federation

The meeting of the Presidential Council for Economy Modernisation and Innovations of Russia, chaired by D. Medvedev, Prime Minister of the Russian Federation, was been held on 1 October 2013 in Klimovsk, near Moscow.

The session was dedicated to innovative development in the housing and utility sectors and took place at Klimovsk Pipe Plant. Before the session, Dmitriy Medvedev had visited production shops and learnt about modern pipe production methods for gas, water, and sewerage, as well as the production process for fittings and plastic manholes used for utility pipeline construction.

Dmitriy Medvedev pointed out that housing and utility infrastructure is possibly the most complicated area of the national economy. Even though we have vast resources, we lose a significant part of these resources during transportation: 27% of water, and not less than 15% of heating (which is why the meeting was held at a modern plastic pipes plant). Consumption of energy resources by housing and utility enterprises on average is 25–30% and can sometimes be 50% higher than in advanced European countries.

The PM pointed out that about 60% of fixed assets are past their operating life. This means an increased number of emergencies, increased losses, and very high operating costs. Funds are used for ongoing maintenance, while modernisation is financed by any remaining funds. This is one of the most important challenges we must overcome.

The Government participates in housing and utility infrastructure modernisation using Federal Special Purpose Programmes via the Housing and Utility Reform Fund. Despite the shortage of funds they must work efficiently and encourage deployment of modern technologies, and of durable and energy-efficient materials.

D. Medvedev said that this industry does not presently attract invest-

ment. The formation of a legislative basis for regulating the housing and utility sector has to be completed to increase private investment. Subjects of the Federation advised to take part as regions will have to adopt water and heating supply schemes, complete accounting of communal infrastructure objectives and take long-term tariff solutions. It is necessary to pay special attention to innovative technologies to avoid tariffs increase as they are the main key to a cost-effective solution.

The PM also made a point about technical regulation issues. Dmitriy Medvedev thinks the norms, standards and rules are changing and need constant upgrading as it is necessary to give new technologies and materials a chance. On the other hand, performance requirements should be toughened, as well as the safety and reliability of the infrastructure as a whole.

Support from the Government is given to innovations through the well-known Development Institutes. About 53 billion rubles was invested in housing and utility infrastructure projects in 2011 and 2012–2013. Over 2 billion was invested in direct support of research and development and cooperation programmes between higher education institutions and hi-tech industry.

Next Mr. Slyunyaev, Minister of Regional Development, gave his speech. He said that innovations in housing and utilities are two times lower than average in Russia, and that they're the lowest compared to other types of economic activities. Relative share of innovations, goods and services in housing and utilities is 0.4 % and has contracted 4 times since 2009.

The Minister highlighted the fact that modern technologies are rarely used and that innovations themselves don't improve quality in the housing and utility sector. That's in spite of the fact that the turnover of the housing and utility industry is over 4 trillion rubles a year. There are over 36,000 enterprises and companies operating in the sector.

The Minister cited the main reasons for low innovation activity in the housing and utility sector, and talked over some ways to improve technical legislative regulation and deployment of management innovations. At the

end, he observed that the housing and utility industry (with a necessary investment – estimated at 9 trillion rubles) can be considered as an infrastructure megaproject with a colossal social and economic impact. But this project is impossible without the right governmental funding and support measures.

Mr. Chibis, Executive Director of Development at the Non-commercial Housing and Utility partnership, spoke on behalf of the expert council working group. He suggested that the efficiency growth potential of the industry is not less than 40%. It could be estimated as a saving of 360 million rubles which makes two-thirds of the required annual investment in water and heating supply.

A transition to long-term tariff regulations, allied with savings retaining schemes with energy service companies, and the introduction of concessions from 2014 will all help create conditions for financing and an economically-motivated deployment of innovative technologies.

Mr. Chibis also pointed out that it is necessary to promote a reduction in consumption. Fixed overall payment and savings will present an opportunity to invest money in industry development. He suggested that the implementation of pilot projects in different regions in 2014 would show the actual results of innovations deployment.

B.F. Vainzikher, General Director of Complex Energy Systems CJSC, spoke about a project in the Kirovskiy District of Perm. There are over 1.3 thousand buildings, half of which are low rise, with about 130 thousand people. 75% of networks are worn out altogether, some of them are unowned networks; about 55% of residents experience excessive heating while 20% are constantly without heating. The idea of the project is to simultaneously install individual heat supply stations with a full renovation of heating distribution networks. This will eliminate the problem of hot water supply cutoffs, reduce losses from the present 26% to 10%, and radically reduce emergencies. Moreover, the volume of heat consumption by an average resident will reduce by 20%. The project estimate is 1.5 billion rubles. 1 billion will be paid off by energy efficiency. 450 million is needed to install individual heat supply stations in low rise buildings where energy services contracts cannot be recovered.

B.F. Vainzikher highlighted that this project can only be implemented with one heating supply company and it would not need government financing if the price was set at the level of an alternative boiler house.

E.S. Arapov, Head of Orenburg administration, explained investment dynamics in the utility infrastructure of Orenburg. The volume of financing has doubled within 2 years reaching 1.6 billion in 2013, with half of all investment coming from non-governmental sources. Innovation projects in water and heating supply, including solid household waste processing and trenchless technologies were presented. A 23% decrease in electricity consumption in the Orenburg utility sector within the period 2010–2013 is clear evidence of effective measures.

There were further lively discussions around the hot innovations issues in the housing and utility sector, including tariff regulation and the conditions of private and government partnerships. There were many interesting suggestions made by A. Melnichenko (EvroKhim), A. Abramov (Evraz Holding) and A. Chuvaev (Fortum). Mr. Novak, Minister of Energy and S. Novikov, Head of Federal Tariff Service answered numerous questions, while many innovative products were presented by E. Pupyrev (MosvodokanalNIIproekt) and M. Gorilovskiy (the POLYPLASTIC Group).

A. Dvorkovich and D. Kozak, Deputy Chairmen of the Government, A. Belousov, Assistant to President of the Russian Federation, Ministers M. Abyzov, D. Livanov, A. Ulyukaev, A. Nikiforov, R. Minnikhanov, President of Tatar Republic, D. Pestov, Deputy Chairman of the Government of Moscow Region, V. Vekselberg, President of Skolkovo Centre, F. Karmazinov, General Director of Vodokanal of Saint Petersburg, K. Tsitsin, General Director of the Housing and Utility Reform Fund, A. Menshov, Chairman of the Board of deputies of Klimovsk, S. Nikitin, General Director of the Strategic Initiatives Agency and many others took part in the session.

Over 50 participants had a chance to visit the exhibition of innovative pipe products hosted by the POLYPLASTIC Group: plastic pipes with diameters up to 3 metres, fittings and accessories, plastic manholes, valves etc. were all on display. Specialists answered the questions of high profile guests who were genuinely interest in the unusual and varied range of plastic products.

Following the session, relevant ministries were tasked to draft proposals on improving tariff policy which will be implemented in the heating supply sector from 1 July 2014. The proposals are expected to contain economically justified maximal price levels for heating energy, corresponding the price of the energy from an alternative source using the best available technologies.

The Federal Tariff Service, the Ministry of Energy and the Ministry of Regional Development were asked to assess the effectiveness of the heating energy tariff regulations for heating supply organisations and the possibility that they could independently set the price for energy supply within the set frame of tariffs (including long-term contracts for heating supply). A report to the Government will follow.

The Federal Tariff Service, the Ministry of Economical Development,

the Ministry of Energy and the Ministry of Regional Development must prepare initiatives on changes in the legislation of the Russian Federation for heating supply, water supply and distribution. They must ensure transfer of the regulated companies to long-term tariffs within the financial year before 1 January 2016 – or within a financial year for organisations switching to long-term tariffs in 2014. And it all needs to be done without security constrained tariffs for heating energy, thereby limiting the index of tariff changes in water supply and distribution based on an average set for Russian Constituencies.

The Ministry of Regional Development, the Ministry of Energy, the Federal Anti-monopoly Service, Gosstroy, Rosstandard, the Russian Federal Consumer Rights Protection and Human Welfare Control Service in cooperation with the Ministry of Finance and the Expert Council of the Government of the Russian Federation, the Analytic Centre under the Government of the Russian Federation and development institutes looking to deploy new technologies had to present coordinated suggestions (Roadmap Project) on modernisation of technical regulation in the Housing and Utility sector before 4 December 2013. They had to provide increased reliability and energy efficiency for utility units, and energy efficiency for newly built capital construction units with gradual toughening of the indicators up to 2020.

The open annual directory of the best available technologies, typical technology solutions in construction and the modernisation of housing and utility sector (containing information on prices, and finance models for deployment of such technologies) must be published before 1 July 2014.

Rosstandard, the Russian Federal Consumer Rights Protection and the Human Welfare Control Service and Gosstroy should be guided by the necessity of new technologies deployment contained in the directory when drafting regulating documents. Before 1 November 2013 the Ministry of Economy, the Ministry of Energy, the Ministry of Regional Development and the Federal Tariff Service must work out suggestion on investment capital revenue to try to stimulate private investment and innovation technologies in heating supply, water supply and distribution.

PLASTIC PIPES MOSCOW 2013

INVENTRA press release

The Plastic Pipes International Conference, dedicated to the world plastic pipes industry, was held on 3–4 October 2013 in Moscow for the first time. The conference was organised by CREON Energy and INVENTRA, part of the CREON Group, and the Plastic Pipes Conference Association – the international association created to organise and hold conferences for the plastic pipes industry.

The event brought together over 200 participants from 20 countries, from raw materials suppliers to gas, water and water disposal pipeline construction companies – all major market players in the world plastic pipes industry. 31 presentations were given over the two days of the conference. The presentations covered summaries of regional markets, statistical data and advanced technologies.

The Plastic Pipes Exhibition was also held during the conference. Exhibitors included companies like

Baerlocher, LyondellBasell, Rollepaal, MOL, Piovan, Pipelife, the POLYPLASTIC Group, AGRU Kunststofftechnik, IPM и IPT Institut fur Pruftechnik Geratebau.

Zoran Davidovski, Chairman of the Organising Committee of Plastic Pipes Moscow, explained in his welcome speech that the decision to hold the conference in Moscow was due to the rapid development of the Russian plastic pipes market. Increased capacity of quality pipes production, and growth in the multilayered plastic pipes market were given as the main developments. It is estimated that Russia's annual market volume has reached over 0.5 million tonnes, with 85% of plastic pipes produced locally.

Russian plastic pipes producers have been on a difficult journey given the absence of raw materials, and a lack of government understanding which led to legislative vulnerability. Nevertheless, there are some world-standard Russian companies breaking the mould. "Just a few days ago the POLYPLASTIC Group, the leader of Russian market, hosted Prime Minister Dmitriy Medvedev at their plant. He could see the production process in person. We hope that from now on the government approach to the plastic pipes industry in Russia will change and there will be local companies of world standard," said Fares Kilzie, Chairman of the Board of Directors of CREON Energy in his opening speech.

The first day of the Conference saw some summary presentations. **Noru Tsalic**, the Senior Vice-President of the Consulting Division of AMI concentrated on the world pipe market in 2012 – which was estimated at 113 billion US Dollars. The Pacific Ocean region took a major 41% share, Europe (including CIS Countries and Turkey) made 26%, NAFTA (Canada, USA, Mexico) made about 18%. Plastic pipes made over 50% of the market share (63 billion US Dollars). It is estimated that the plastic pipes share will be increased by 37 billion US Dollars by 2017.

Kirill Trusov, Director of the Pipeline Systems Department at POLYPLASTIC Group described the situation in PE pipe markets in Russia, Ukraine, Belarus and Kazakhstan (RUBK). It is estimated that the total PE pipes production volume in 2012 was about 440 thousand tonnes with 330 thousand tonnes produced in Russia. PE pipes were used in water systems (61%), gas supply (26%), sewer systems and communication (13%). Overall plastic pipes consumption per capita in RUBK countries was 3 times lower than in Europe and 2.1 times lower than in China. Having said that, the utility networks in Russia are in deterioration. 240,000 km of water pipelines, 103,000 km of heating pipelines and 78,000 km of sewage need replacement. Moreover, there are many settlements in the country with no water and sewer systems at all. This represents enormous potential for the PE pipe market in Russia, where according to 2012 data, the market share of steel pipes was 65%, with 24% of PE pipes, 6% of PP pipes, 3% of PVC.

Oleg Kozlov, Technical Director of Alterplast presented his paper at the end of the first day and gave an overview of the Russian plastic pipes and fittings market based on PP-R, PEX, PERT and reinforced plastic pipes. The presentation included data on consumption of pipes with diameters up to 110 mm from 2008 to 2012 in Russia. The speaker summarised that PP pipe consumption increased from 53% to 58% and PEX/PERT from 6% to 10% but market share of metal pipes declined from 41% to 32%.

In the second session **Mohana Murali**, Senior Technical Service Manager of Borouge, spoke about PE pipes application specifics in the oil and gas industry in the Middle East. Statistical data shows an annual cost increase related to the replacement of corroded metal pipes. The oil and gas industry is now looking into PE pipes as a more economically viable solution using PE pipes for pipeline construction and PE liner for steel pipes. In particular, the speaker showed the results of tests of PE pipes which have been transporting highly corrosive crude oil at a

temperature of 50°C and pressure of 1.0 MPa. The research showed that the properties of the pipe were changed imperceptibly, therefore PE pipes are an effective alternative to steel pipes in heavy-duty service.

Detlef Schramm, the Marketing and Assets Manager of PE Pipe Europe LyondellBasell, gave a presentation about HDPE pressure pipelines, with reference to their advantages and crack resistance, their high thermal stability and resistance to disinfectants.

The new types of LyondellBasell HDPE PE100: Hostalen CRP 100 RT black and Hostalen 4731 pipes were also presented. Both materials are used for pipe production for hot liquid materials transportation, desalination plant pipes and power cables. The speaker explained more about CRP 100 RD black – PE100 material which is highly resistant to disinfectants in the domestic water distribution systems.

Christophe Salles, Borealis Marketing Manager, spoke about gravity pipelines. He presented an overview of pipe grade PP used in the sewer systems. He described their advantages in detail and showed efficiency factors during transportation, installation and operation.

Michael Pluimer, Technical Director of the corrugated pipes division of PPI, covered HDPE used for corrugated pipes production.

The third session was opened by **Lola Ogrel**, Inventra Analytical Department Director, who presented a review of PVC pipes market in Russia and CIS. Russia's PVC market volume is estimated at almost 50 thousand tonnes. PVC pipe consumption volume has grown 2.4 times within the last 10 years, and production has grown 3.3 times. The consumption increment was supported by home producers where the share of imported products was constantly decreasing. Other CIS countries, unlike Russia, mainly consumed imported pipes.

Steve Tan, Executive Director of PVC4Pipes spoke about the possibilities and usage limitations of recycled PVC in pipes and other plastic products. **Anders Udo**, Technical Product Manager of Baerlocher, gave an overview on the production technologies, practical experience and world market

PIPELINE SYSTEMS EVOLUTION

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LAST CENTURY

AT PRESENT

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without compromise

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prospects for PVC stabilisers used for pipe production.

Rob Spekreijse, CEO Rollepaal, spoke about advantages of oriented PVC for water pipelining and sewage pipelines.

Zoran Davidovski opened the last session of the first day of the conference. He spoke about CO_2 emissions during production and operation of plastic pipes. He said that research shows that the CO_2 footprint of plastic pipes systems is significantly lower than that of the pipelines made of traditional materials.

Marco Mekes, Manager Testing & Certification Kiwa Nederlands, spoke about the fire safety of plastic gas pipelines. The research done in the countries where plastic pipework is approved for gas in buildings has been proven safe. The results showed that plastic pipes don't influence the statistical emergency record on gas pipelines.

The speaker also suggested that amendments should be made in the national and international standards to allow the use of multi-layered pipes in the gas industry.

Steve Sandstrum, Director Technical Services of ISCO Industries spoke about the role of HDPE in the design, construction and operation of low pressure hydroelectric stations.

The second day of the conference started with an overview of the PE market in the USA presented by **Tony Radoszewski**, President of PPI. He briefly described the economic situation in the country and shared his view on the possible growth of PE market in the USA. He said that the PE production capacity of the USA and Canada will increase to 5.7 mln tonnes (11.4 billion pounds) by 2018 and the demand for plastic pipes will raise 6.2% each year until 2017.

Rainer Kottmeier, Managing Director of Battenfeld-Cincinnati talked about problems related to the production of bigger diameter pipes – with appropriate solutions.

Igor Gvozdev represented the POLYMERTEPLO Group and gave a presentation about use of PEX pipes in high temperature water systems.

Ton Schoenmaker, International Project Manager of Pipelife Group finished the fifth session by presenting an overview of PE sewer manholes and inspection chambers in

Europe and Russia within the last few years.

The sixth session of Plastic Pipes Moscow was dedicated to the production and use of PVC pipes. **Pavel Rodionov**, Sales and Marketing Director of RusVinyl, spoke about raw materials supply for PVC pipe production in Russia.

Lorena Guterres, Commercial Director of Molecor Tecnologia spoke about recent developments in PVC-O.

Jean-Francios Grenier, Strategic Marketing and Business Development Department of Aliaxis, gave an overview on training manual for PVC manufacturers.

Stephan Schuessler spoke about the use of PVC pipes in bioreactors for micro-algae growth for biopower.

The next session started with a presentation from **Andre Nijland**, Regional Licensing Manager in the Northern America and Asia Pacific Region of Wavin Overseas, about the advantages of OPVC biaxial pipes.

Giorgio Santella, Marketing Director of Piovan, spoke about cooling system for PE production lines. **Peter Postma**, Piping Systems and Materials Consultant of Kiwa Technology, spoke about the sustainability of nondestructive methods for PE joints testing. **Andreas Frank**, Dipl.-Ing. at Polymer Competence Centre Leoben, spoke about a comparison of accelerated tests for lifetime assessments for PE grades.

Steven Folkman, Professor of Utah State University, discussed the survey results relating to water main failures in the USA and Canada. **John Kurdziel**, Production engineer of Advanced Drainage Systems, spoke about alternative testing methods for buckling. The presentation from **Tanja Piel**, Senior Scientist PE research of Borealis Polyolefine, was dedicated to new laboratory testing for crack resistance.

An iPad draw, sponsored by Rollepaal was held for all participants at the conclusion of the event. The prize winners were Veselin Panchev, Sales Manager at Unicor, Alexander Rider, Regional Sales Manager at IPT Institut fur Pruftechnik Geratebau and Renar Valeev, General Director of Instar.

The organisers of Plastic Pipes Moscow would like to thank conference sponsors, Baerlocher и LyondellBasell; RusVinyl – our coffee break sponsor, and our event partners: MOL, Piovan, Pipelife, Wavin, Arctic-T and the POLYPLASTIC Group.

K 2013 EXCEEDED
THE HIGHEST EXPECTATIONS

POLYPLASTIC press service

The K 2013 International Trade Fair was held on 16–23 October 2013 in Dusseldorf.

Held only once every three years, this is the largest plastics and rubber industry event in the world. Producers of materials and additives, different plastic products and semi-finished goods get together with processing and analytical equipment specialists and technology companies to show off their latest innovations.

Among the participants of K 2013, companies from the plastic and rubber industry had particularly high expectations. Inspired by the great developments in the industry over the last few months, and confident in their ability to offer innovations across all areas of the production chain, even their high expectations were exceeded over the eight days of the trade fair.

The event hosted over 3,300 participants from 60 countries, and 218,000 visitors from over 120 countries over the eight days. According to the organisers, 58% of visitors – that's 126,000 people – were from abroad. Just under half of them came to Dusseldorf from far afield – from Angola, Burkina Faso, the Falkland Islands, the Yemen, Malawi, Nepal, New Caledonia, Oman, Peru and Turkmenistan. As expected, most of the foreign guests (over 30,000 specialists) came from Asia: South, East and Central Asia, including the Middle East. The largest group was from India and this event saw the largest ever number of visitors from China, Indonesia, Iran, Japan and Taiwan.

The number of visitors from North America (USA and Canada) has significantly increased to over 8,100 people. About 11,000 specialists came from

Latin America, mainly from Brazil, Mexico, Argentina and Columbia. Russian speaking visitors were also present. The group from former CIS countries was one of the largest at the fair.

The seniority of the visitors was also important: over two-thirds of them were top and middle managers, over half were investment decision-makers. A significant proportion of visitors came from research and development and design divisions.

The organisers and exhibitors reported exceptionally high activity rates among visitors, and saw huge interest in new product presentations and a real desire to invest in innovation. Indeed, a remarkable number of business deals were agreed, some of which were worth millions.

The chairman of the Exhibitors' Advisory Board for K 2013, Ulrich Reifenhäuser, was extremely pleased with the results: "We had not expected visitors' willingness to invest to be this high! Many innovative products and applications launched in Düsseldorf met with great interest from trade visitors. The innovations were not just admired but led to concrete negotiations and signed contracts. Many customers are extending their capacities and are investing in new technologies to sharpen their global competitive edge. We very confidently anticipate strong post-fair business and expect further growth in our sector."

Werner Matthias Dornscheidt, President & CEO of Messe Düsseldorf, was delighted, along with his team, at the excellent response: "It has been proved again that K is, and remains, the most important event in the rubber and plastics industry! This is where new technologies are launched alongside fully matured advanced developments and this is also where orders are placed for these innovations. Foreign visitors to K 2013, in particular, showed an extremely high willingness to invest and one in two visitors came

to Düsseldorf with specific purchasing intentions in mind. Even if the size of delegations from the individual buying companies dropped slightly, no firm producing or using plastic goods missed this chance to find out about the innovations of today and the trends of the future at K 2013."

Solutions for energy efficiency and resources saving were dominant amongst the exhibited products, and the sector is driven by environmentally friendly and cost effective production.

Machinery and plant construction – the largest exhibiting sector at K 2013 with around 1,900 exhibitors – was also at the focus of visitors' interest. Around two-thirds of registered visitors said innovations in this sector were of high interest to them. 42% of visitors were interested in raw and ancillary materials, 22% had their interest in semi-finished goods and plastic and rubber components. The visitors represented all major sectors: building and vehicle construction, packaging and electronics, medical engineering and agriculture. Overall, K 2013 visitors expressed a high opinion of the exhibition (which encompassed 19 halls). 96% of them have confirmed that they achieved the goals of their visit.

K 2013 also highlighted a number of trends in today's plastic pipes industry:

Equipment for pipe production

Three years ago K 2010 was dominated by productivity issues, so producers of extrusion equipment presented longer screws and heavily increased rotation speed. The main priority for innovation today is energy efficiency. The main reason for change is the price of power supply (almost

two times higher than it was 10 years ago). Some analysts think that all the reserves for increased productivity of extruders are exhausted, so energy saving is now a hot topic for consumers.

Extruder manufacturers are looking into the following technologies to save energy:

– Gearless main drives
– Intelligent drive control systems
– Use of friction energy
– Completely isolated extruder with energy use control.

Reifenhäuser presented a prototype of a completely isolated single screw extruder with an expected reduction of energy consumption of about 20–30%. Although the extruder on display was just a prototype, it does give indications for the future.

Most of the extrusion line producers drew the attention of the visitors with possibilities of significant resources savings though the inner cooling of pipe heads. Some of them come with exotic designs and generated great interest with the number of co-extrusion layers in the pipe wall (up to 9 layers!). Heat and water recuperation were also taken into consideration.

Production of standard extrusion equipment is moving to China, India and Turkey. Italian producers are becoming Europe's most popular choice with their medium-sized manufacturers offering good value for money and a high level of customer service. According to the latest review, extrusion equipment producers like battenfeld-cincinnati or KraussMaffei are losing their positions. Some of the bigger companies still seem to struggle with individual service provision, especially compared with small and medium processors.

Equipment for plastic pipeline installation

Traditionally, Pavilion No.11 is dedicated to manufacturers of plastic pipeline installation equipment.

Most of the new types of butt welding machines presented focused on portability – with special transport buggies, wheels or crawlers. Previously, mobile welding units were a trademark of McElroy, but now almost every manufacturer offers a similar solution. The idea of mobile units isn't novel, although it still drew lots of attention at this trade fair.

The portability of the welding units in Russian conditions (strong winds, torrential rain and temperatures below zero) is not that critical. Moreover, if welding is being carried out under a heated tent, moving the whole thing (tent, generator, fan heater etc.) can be quite troublesome. Therefore it is much simpler to pull the pipe string through after the welding.

It also needs to be borne in mind that the price of a mobile welding unit is two-three times higher than its stationery alternative. This can negatively impact the sales targets of these modern machines.

Analytical equipment

Equipment for the identification and testing of plastic materials and products was also presented at the fair and we can see two major developments. First, there is the launch of special routine analysis solutions for the plastic processing industry, not for the experts. For example, NETZSCH-Geraetebau GmbH (Germany) presented DSC 214 Polyma, a new differential scanning calorimeter. The unit has a number of improvements in design (with enhanced oven and sensor, improved crucible) and software. Upgraded software allows differential scanning calorimetry (DSC) thermogram calculations and can even identify the plastic using its incorporated database.

The second development sees some of the different analysis methods of various manufacturers being combined. A couple of years ago, this was an unusual thing to do however today, most producers offer these solutions. Mettler Toledo has presented a system featuring the Mettler Toledo TGA/DSC1 thermal analyser and Thermo Scientific Nicolet iS10 Fourier Transform Infrared Spectrometer.

Some of the producers go further and offer ready-made solutions. For example, NETZSCH-Geraetebau and Bruker Optic offer an integrated

STA 449 F1/F3 and IR Alpha spectrometer system. This is a good example of the globalization of the automatic equipment market.

'Kunststoff bewegt – Plastics move the World' Special Show

Visitors from all over the world enjoyed a K 2013 special show entitled "Kunststoff bewegt – Plastics Move the World". This show was dedicated to the contributions that plastics have made to 'life in movement', particularly the role they play in different aspects of human mobility, and the way they've helped to express emotions through, for example, art and design. Future-oriented issues like population growth, energy needs and climate change were also discussed during the show.

Unfortunately, Russia was represented by a smaller number of delegates than at K 2010. As ever, the POLYPLASTIC Group stand was in the central pavilion (No.6) – and was the main meeting place for many Russian visitors. Here the products of the POLYMERTEPLO Group, Radius Systems of

Britain, AEON and Subterra were all presented. These companies work under incorporated management and can offer a full range of integrated services in CIS countries and in Europe.

TAIF Group showcased Kazanorgsintez and NizhnekamskNeftekhim in pavilion No. 5 and there was a stand in pavilion No. 8 where a number of Russian companies were presented. But that's all.

Neither SIBUR nor other large Russian polymeric companies took part in the fair. We hope they will change their mind next time so that Russia will be better represented at this very important international plastics and rubber event.

The next K 2016 Trade Fair will be held from 19 to 26 October 2016 in Dusseldorf.

We'll look forward to seeing you all at our stand in three years!

AEON JOINS RADIUS: AN OBVIOUS WIN-WIN

Dmitriy Kirin

The POLYPLASTIC Group has announced its new acquisition: in August 2013, Radius Systems, part of the POLYPLASTIC Group, acquired AEON Group Holdings Ltd., a leading valve manufacturer. In their press release, Radius Systems stated that the POLYPLASTIC Group had no hesitation in supporting the acquisition which complements their core pipes and fittings production business with associated products, services and technologies.

AEON

The AEON Group was founded in Great Britain in 1996. Its head office has control over finance and logistics, and conducts general management, engineering, research and development. Main production is based in Poland, with additional warehousing, sales offices and service centres in Dubai (UAE).

The company is among the top ten leading European developers, manufacturers and suppliers of valves to the oil and gas, water and fire protection sectors. The product range includes various types of gate valves, butterfly valves, return valves, connection fittings, clamps and others.

Gate valves for water and gas pipelines are AEON's trademark. They're the culmination of 17 years of research, innovation and cooperation with leading specialists in the gas and water industry, including famous companies like British Gas and Thames Water. A number of technical solutions and design characteristics of AEON's gate valves are patented, e.g. the integrated wedge with double seal. These solutions give AEON gate

valves unique operating characteristics. A double seal ensures 100% isolation in any flow direction while the plastic guides at the gate reduce friction. This allows horizontal or vertical installation without any increase of torque. The lower part of the wedge is specially shaped to create a turbulent zone beneath it during closure; the flush effect prevents sedi- mentation of the coarse fraction contained in the operating fluid. The unique design of the top part of the wedge also allows for easy replacement of the gland seal.

AEON products are manufactured in compliance with all relevant international standards (including ISO 9001, ISO 14001 и BSI Kitemark), EN 13774 cat. 4 DVGW, GIS V7 and all Russian standards and GOSTs.

The quality of AEON products is approved by certificates and test protocols as well as by its application all over the world. AEON valves are used at La Fenice Opera House (Venice, Italy), one of the largest pumping stations in Sharjah (UAE), Regents Park Road in London, and Veolia Water facilities in over 50 countries and more.

Who's set to gain?

Radius ...

Radius Systems Limited is a leading manufacturer of plastic pipeline systems in Great Britain and Ireland. The company has an 80% share in the gas industry, and a 30% share in the water supply industry and its customers include some of the largest British gas and water suppliers such as National Grid, SSE, Northern Gas Networks Wales and West Utilities, United Utilities, etc.

AEON gate valves are among the very few certified by market giant, British Gas, therefore acquisition of AEON is a logical move. Adding AEON valves to the product range gives the company an opportunity to provide complete, effective solutions to the gas pipeline construction industry.

...POLYPLASTIC...

POLYPLASTIC shareholders have supported the deal knowing that it will strengthen its British subsidiary in the local market. AEON valves are well known in Russia and are sold by several trade companies in different regions of the country. The products are certified by Rostekhnadzor for use in the gas supply industry. This significantly eases the planned sales expansion. Moreover, the group's pipe trade divisions appreciate the increasing demand for a new valve range for the gas industry. The TALIS Group will remain a strategic partner of the POLYPLASTIC Group.

...AEON

The AEON Group intends to increase sales 3–4 times within the next 3 years through substantial expansion into existing markets in Britain, Russia, Poland, Eastern Europe and the Middle East. It will also introduce the product in France, Germany, CIS, Northern Africa and Asia. Derek Watson, General Director of AEON Group is convinced that the merger of POLYPLASTIC and AEON will give effective access to wider and diversified markets, which will be more attractive to existing customers.

There is plenty of potential for synergy. This is a good all-round deal, particularly for Russian customers who will get the opportunity to choose components for their projects from the world's leading manufacturers.

RADIUS...
A YEAR IN THE LIFE!

Andy Taylor – CEO and Member of the Board of Radius Systems Ltd., Head of Mergers & Acquisitions committee.

1999 – 2005: Group Managing Director of Hepworth Building Products, a division of Hepworth Plc, a £700m turnover Heating and Building Materials Group.

2005 – Oct 2010: Wavin BV, Executive Vice President, Member of the 4 man Management Board (by way of the acquisition of Hepworth Building Products in 2005) with Executive responsibilities for the Regions UK/Ireland, South West Europe, South East Europe and all activities outside of Europe, the Building & Installation Strategic Business Unit, R&D and the Group's commercial activities.

When the Bank consortium invited me to join Radius in mid-2012 the Company was on its knees. The Private Equity backed Management Buy Out had failed leaving management with nothing from their investment and the Banks in control trying to minimise their losses. All cash went to capital repayments, interest and fees and there was no investment in the future of the Company. The work force was disillusioned, management were demotivated, morale was at its lowest, we had lost our biggest customer and our wider client base were very nervous about the future of Radius Systems. It was clear that the Company needed to find a new 'home' and in autumn 2012 that's what we set out to do.

We ran a process through end 2012 into 2013 and of course, as everyone knows, the successful bidder was POLYPLASTIC. During my Wavin years I had come to know of POLYPLASTIC when, in 2008, we had some joint discussions on possible collaboration scenarios. It was then that I first got to know Valentin Buyanovsky and Miron Gorilovskiy and when Valentin turned up in the Radius sale process, knowing what I did about the POLYPLASTIC Group, I knew this would be the perfect solution for Radius. We needed a parent who understood our products and processes, our technologies and our routes to market. We needed an environment of joint trust in which Radius could grow organically in its home markets but also contribute to the greater good of the wider POLYPLASTIC & POLYMERTEPLO Group. It was therefore not a surprise when we consummated our 'marriage' at the end of February 2013.

Cost and Growth are the two key drivers in any business and with those in mind we set about identifying the key synergy project areas where scale and technology exchange would bring the quickest results. However, before we could embark on this we had to educate our workforce and our customers about our new owners. Any workforce responds to integrity and honesty from management. Since the sale process had begun we made sure that we delivered what we promised and even the bad news became palatable because it did not come as a surprise. They were only too happy to be out from under the previous ownership regime and part of a Group which understood what we were all about. This in itself paved the way for an excellent start to our life together. The clients were also overjoyed to see the UK market leader operating within a sound financial structure and although not intimate with the POLYPLASTIC Group, recognised the stability that came as part of the deal.

So back to the Cost and Growth scenario and the strategic re-positioning. The first priorities were to take immediate advantage of any cost benefits arising from the combination of the two businesses. Kirill Trusov's team along with the UK purchasing team immediately embarked upon a re-negotiation with our raw material suppliers. This project will realise an annualised benefit just on PE 100 of €420k based on historical volumes and prices.

Radius had already planned a major 'complexity reduction' programme with regard to converting our core product to black. In combination with the raw material cost reductions we have achieved so far we expect an annualised saving on raw material alone of c. €3m. This project has also benefited greatly from our combined scale with equipment suppliers with savings of more than €300k against initial quotations received by Radius.

On the reverse aspect POLYPLASTIC embarked on having the Radius electrofusion fittings range specified for use in the Russian market along with keeping existing cooperation with George Fisher. This was not a simple process but specification was finally achieved towards the end of last year and Radius has now supplied significant initial quantity of fittings for sale through the Group and we are now looking into the opportunity to create a fittings manufacturing cell in Russia.

In November we concluded the transfer of the redundant 30 KT PVC mixing plant and 3 complete multilayer extrusion lines from our Lurgan (Northern Ireland) facility to Russia. Engineers from the UK will oversee the commissioning of the equipment later this spring.

When assessing the Growth drivers for the business we had to look closely at our business model. Radius 'top 10' customers accounted for over 70% of sales. Those clients, compared to the size of Radius, were economic Utility giants with huge influence over Radius. We decided in conjunction with Miron and Valentin that we had to maintain our position with the 'Big guys' but diversify into different products and technologies and also different routes to market.

The Radius brand has a massive reputation for quality and innovation and can be applied to many associated products and technologies so when the opportunity to buy the assets of Subterra came along in June 2013, after a very short and positive conversation with our parent, we successfully concluded the deal. The re-lining business is beginning to grow in the UK and a bonus has been the buoyant demand for epoxy and polyurethane coatings for the spray lining technology. We are just completing the move of the coating manufacturing process to our main sight at Hilcote. The interest in Russia for the technology has been a pleasant surprise and last month we dispatched the first Spray Line rig to Russia together with 2 sets of equipment for close-fit PE pipe renovation technologies known commonly as Subline and Rolldown.

In August last year we added water and gas valves to our product portfolio when we completed the acquisition of AEON. A poorly managed business both strategically and financially but a wonderfully innovative range of products which we knew we could improve upon. Since the acquisition we have closed the AEON UK Head Office and combined all back office activities with Radius. We have actively marketed the product to the major Utilities in the UK and now have approvals from all 4 gas utilities. We are expecting our first orders imminently. In Poland we are expanding the facility to be able to handle the new range of AEON 350–600 mm gas valves which we plan to introduce before the end of the year. We also plan to manufacture two sizes (100 mm and 150 mm) type B gas valves locally in Poland where we think we can be cheaper than the landed cost from our Chinese suppliers. In the Gulf, we are chasing local approvals for projects in Dubai, Abu Dhabi and Qatar and have recently won approval status with Saudi Water and Bahrain Electricity and Gas. The polish and Gulf outlets will also be reviewed for the opportunities to stock and sell other Group products.

In late November we concluded the purchase of Redman Fittings, a manufacturer of steel/copper hydraulic compression fittings, from the Tricorn Group. We had identified Redman as a target as the product range complements our Puriton Barrier Pipe Range which allows us to compete head to head with our major competitor in the UK, GPS an Aliaxis company. We have moved the manufacturing process to Hilcote and are preparing for the market relaunch before the summer. The Redman range has also been identified as a potential addition to the Polymerteplo range and an assessment project is underway in Russia at the moment.

Finally, the Group took the decision at the end of last year to establish Radius as the parent company for all Radius and POLYMERTEPLO activities, creating a UK incorporated entity with combined sales in excess of €220m. We are currently working on a number of acquisition opportunities to expand the geographical footprint and the product portfolio of the Group which we will inform you about as they happen.

In conclusion, Radius is thriving in the operating environment created by the acquisition by the POLYPLASTIC & POLYMERTEPLO Groups. We have an energised workforce, a broader, more inclusive offer for our client base, a wider geographical footprint and all as a result of real UK-Russian team work. We have trust and honesty in our working relationships and a clear vision for the future.

PEX-A: THE SAME ROUTE FOR RUSSIA AND EUROPE

By Alexander Shmelev

The structure of the plastic pipes market for heating supply in RUBK (Russia, Ukraine, Belarus and Kazakhstan) is still closely linked to demand, the largest challenge being the need for products that are absolutely innovative by global standards. The market position of various plastic pipeline manufacturers in Russia and CIS markets is defined by three main factors:

- **Large diameter flexible pipes in the range of products (D=110 mm and over);**
- **Chemical stability of the carrier pipes to chlorine and its compounds;**
- **The ability to operate at not less than 95 degrees and 1 MPa.**

Our market is similar to Europe in choosing the basis polymer for carrier pipes: over 90% of carrier pipes used in RUBK countries and Europe are made of PEX-a.

The application of flexible insulated plastic pipes in district heating and hot water supply pipelines in Russia and CIS countries began in the late 1990s and has become quite usual.

As expected, market leaders in plastic pipes applications are the major heating supply companies in metropolitan cities such as Moscow, Saint Petersburg, Kiev and Minsk. Russia's capital city has the largest heating supply networks in the world. About 1700 km of distribution networks have been renovated using plastic pipes.

Conversely, the champions in share of plastic pipes in renovated heating distribution networks can be found among small towns, such as Aktash Village in Altai Region where all 15 km of local heating supply pipelines were renovated using plastic pipes.

Technologies for plastic pipes production and installation in district heating systems came to Russia and CIS countries from Europe where they have been used extensively since the 1980s. However, unlike Europe, where half of the demand is concentrated in low-rise building construction, over 85% of the RUBK demand is used for central heating systems. The main differences are detailed below.

Firstly, the average diameter of flexible pipes in Europe is 40–50 mm (mainly 40 mm) whereas the average diameter of flexible pipes in Russia is 90–110 mm. This means that 125 mm, 140 mm and 160 mm pipes are widely used in Russia but are not so popular in Europe.

Secondly, Russian heating supply systems have a higher heat load. Heating supply networks with operating temperatures 95/70 degrees are higher than the 5th European class of operation (including temperature surges). A large proportion of heating supply networks are operating at 115/70 and 130/70 degrees temperature schedules which are unusual for Europe.

Thirdly, although Russian regulations do not contain specific limitations on chemical composition for transported water, a high chlorine content naturally limits the use of certain types of polymers in pipe production for the housing and utility sector, particularly in pressure pipe production for heating supply networks.

These three factors have dictated the course of development for flexible insulated pipes for heating supply in Russia and will continue to define the market structure.

It should be pointed out that RUBK and European markets develop independently. Today's European market meets demand with domestic production. RUBK demand

for insulated pipes is also covered mainly by local manufacturers and imports account for just 9%.

What insulated plastic pipes are used in Russian and European markets? Considering three parameters: carrier pipe material, type of design of the carrier pipe, and type of insulation –they can be divided into 6 classes:

1) PEX-a, unreinforced with PU foam insulation;
2) PEX-a, unreinforced with PE insulation;
3) PEX-a, reinforced with PU foam insulation;
4) PEX-b, unreinforced with PU foam insulation;
5) PEX-b, reinforced with PU foam insulation;
6) PB, unreinforced with PE foam insulation.

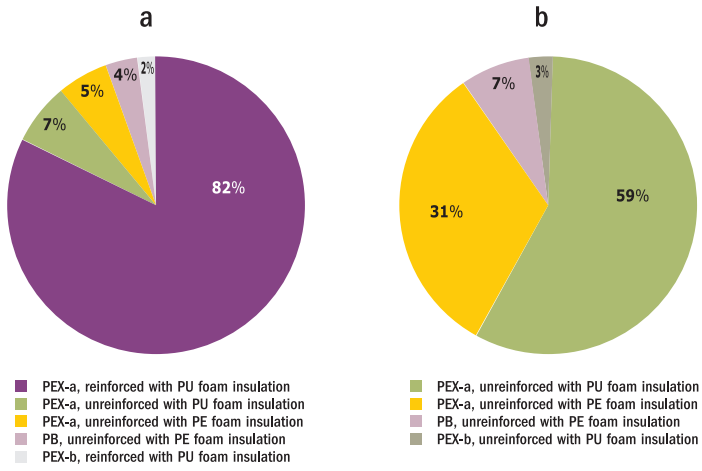
Pic. 1 shows the market structure of flexible insulated plastic pipes for district heating in RUBK countries and Europe in 2013 (according to expert estimates and production companies).

The main structural difference relates to the design type of the carrier pipe: 84% of all plastic pipes consumed by the heating supply sector in RUBK are reinforced systems which work with high operating pressures and temperatures whereas European heating networks, these are not used due to the excessive operating properties.

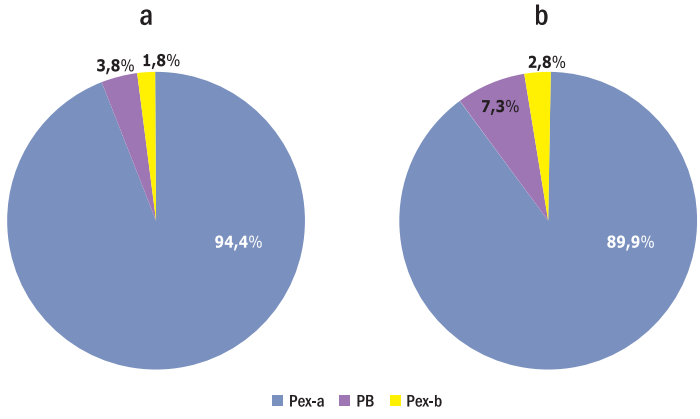
This difference is very obvious considering the total consensus of RUBK and Europe on the basis polymer for carrier pipe (pic. 2) and type of insulation (pic. 3). 90% of combined RUBK and Europe consumption is PEX-a carrier pipes and 2/3 of pipelines are insulated with semi-rigid PU foam.

Finally, Russian heating supply companies, and latterly, those of Ukraine and Belarus, have chosen reinforced pipeline systems. These are called “enhanced reliability pipes” due to their low failure rate. The market choice of PEX-a as a basis polymer for flexible insulated pipes is also logical.

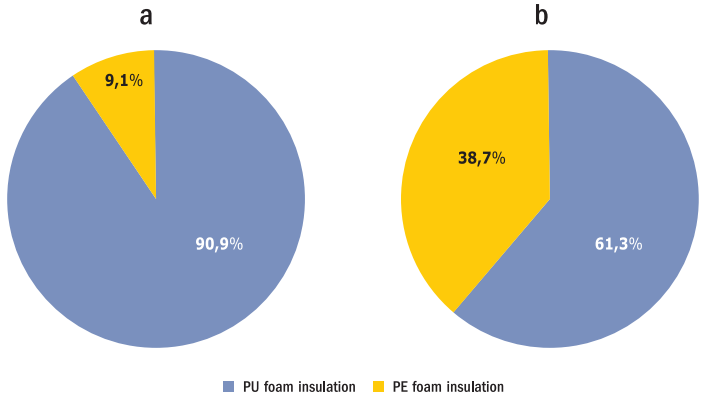
Pic. 1. Flexible insulated plastic pipes consumption in district heating systems by types: a – RUBK, b – Europe



Pic. 2. Flexible insulated plastic pipes consumption in district heating systems by material types: a – RUBK, b – Europe



Pic. 3. Flexible insulated plastic pipes consumption in district heating systems split by type of insulation: a – RUBK, b – Europe



THERMAL PROPERTIES RESEARCH INTO FOAM POLYURETHANE USED FOR PIPE INSULATION

Dmitriy Gvozdev – *Plastic R&D*
Sergey Samoilov – *AND Gaztrubplast CJSC*
Gennadiy Vaskov, Irina Vazhnova – *DOW Izolan Ltd*

Semi-rigid foam polyurethanes can be used successfully to insulate flexible heating and hot water pipelines with an operating temperature up to 130°C. Higher temperatures intensify the processes of thermal and thermo-oxidative destruction of polyurethanes due to the de-compounding of urethane groups and ether links. The necessary increase in the thermal resistance of foam insulators for pipelines with operating temperatures up to 180°C can be achieved with the right modifications – by adding polyurethane polyisocyanurate compounds, and by the aromatic isocyanate cyclic trimerisation process.

A system with a higher content of isocyanate and trimerisation catalysts is used to achieve modified foam plastics. The isocyanate index is used as an evaluation criteria for polyisocyanate content in foam plastics.

We have studied the thermal, physical and mechanical properties of polyurethane foams made in reaction systems with isocyanate indexes ranging from 150 to 470.

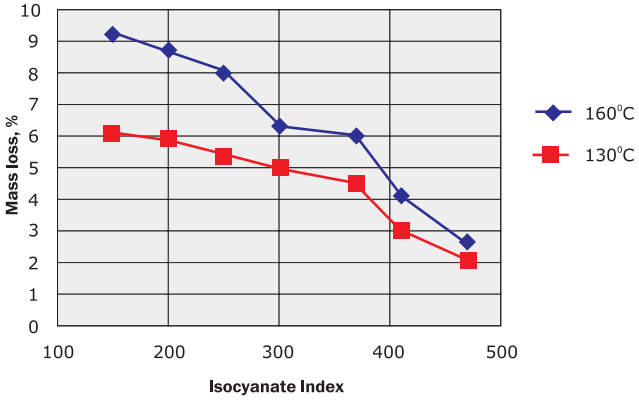
Thermal resistance of foam plastics was evaluated by dynamic thermo-gravimetric analysis in argon and air, at a heating rate of 10°/min and a gas flow velocity of 50 ml/min, also at mass loss at isothermal heating of 130 and 160°C for 6 days.

The elasticity of plastics is checked by their deflection values in a bending test according to GOST 18564.

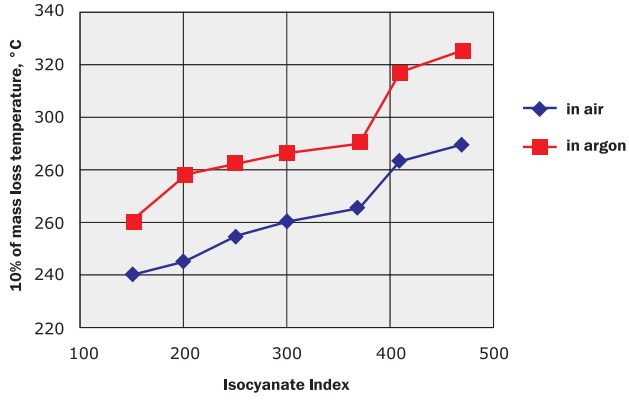
The tests results shown in graphs 1–3 confirm that the thermal resistance of foam plastics increases with the increase of the isocyanate index (due to their increased number of cyclic links) which significantly reduces their elasticity.

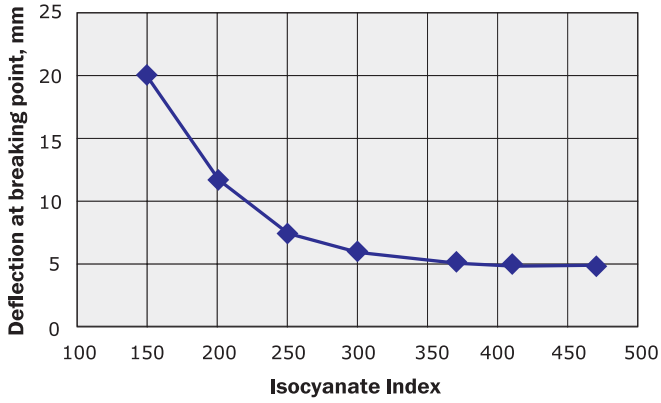
We have also studied the possibility of regulating foam plastics properties by changing the isocyanate:polyol ratio in the reaction system.

Graph 1. Foam plastics thermal resistance in isometric mode

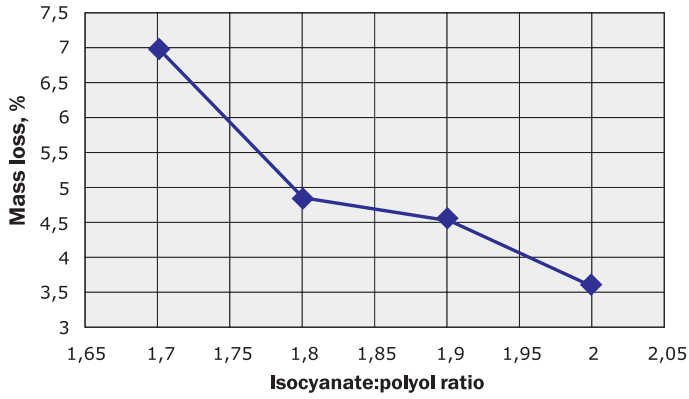


Graph 2. Foam plastics thermal resistance in dynamic mode





Graph 3. Foam plastics deflection strength



Graph 4. Thermal resistance in isometric mode

The components ratio (isocyanate:polyol) in the initial reaction system was in the range from 170:100 to 200:100. A reduction in the isocyanate content below the marked level was not considered due to its tendency to reduce the hardness of foam plastics. An isocyanate increase above the level shown here will also be unreasonable due to the reduced elasticity of foam plastics.

The thermal resistance of foam plastics was evaluated by mass loss at isometric heating at 160°C during 5 days. Vicat softening temperature was determined in accordance with GOST 15088-83 at a heating rate of 120°C/hour and 51 N load.

The test results are shown on graphs 4–5.

As can be seen from the above results, thermal resistance and stability increase with isocyanate: polyol ratio increase in the reaction system is due to an increased content of cyanurate links in the foam plastics structure.

The long-term thermal stability of the insulation was also checked (according to GOST 54468-2011) by determining the relative strain of the foam plastic sample under constant pressure and temperature, corresponding to the operating maximal temperature (180°C) for 300 hours.

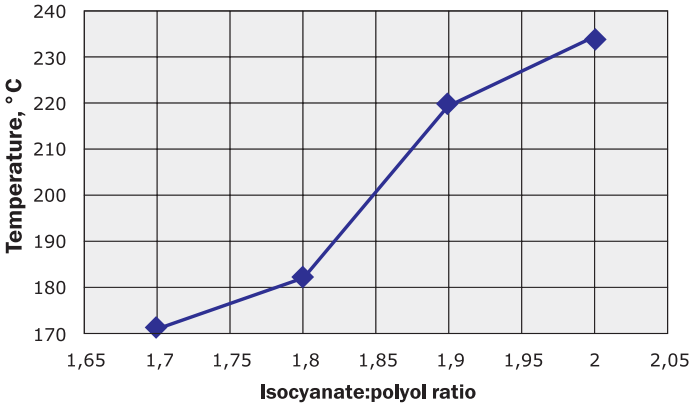
Relative strain at the given data shall not exceed 10%. Long-term thermal stability results in graph 6 show that the relative deformation of plastic samples reduced at isocyanate:polyol ratio increase in the reaction system and the deformation is significantly lower than accepted.

Other properties (density, water absorption, compression strain at 10% deformation) of tested foam plastics are satisfactory and comply with relative technical specifications. Components ratio changes in the reaction system do not influence the heat conduction coefficient (0.027 W/m·K).

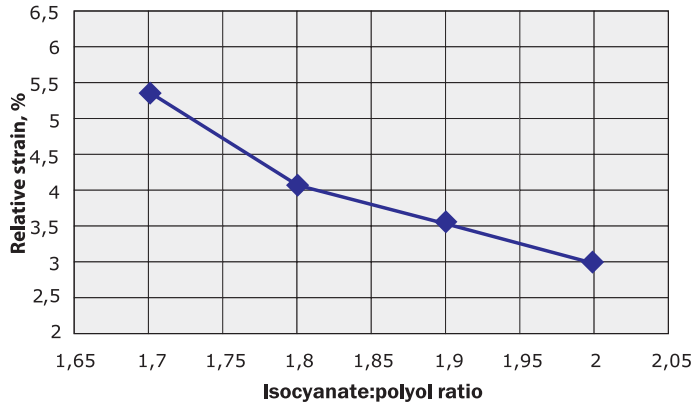
The results obtained show that the tested foam plastics have high thermal resistance, necessary thermal stability and that their heat conducting, physical and mechanical properties are in compliance with technical requirements.

The final choice of components ratio of reaction systems should be done with consideration of technology and economic factors.

Graph 5. Vicat heat stability



Graph 6. Long-term thermal stability of foam plastic



SOCKETS OF CORRUGATED PIPES – RELIABILITY IS THE PRIORITY

Ivan Larikov

The socket-and-spigot joint is the most common type of pipe connection in gravity systems. They can be made of reinforced concrete, ceramic, cast iron or plastic. Socket-and-spigot joints are common with corrugated plastic pipes as well.

The requirements for pipe joints are very strict since corrugated pipes are used in different conditions; quite often in high static (great depth, deep fill) and dynamic (ground movement, heavy vehicles) loads. Pipe joints must ensure integrity in any operating conditions even in cases of pipe bending and deformation.

There are two ways to produce pipe joints: 1) in-line molding (simultaneously with the pipe) and 2) welding of pipe joints made separately. The first method is very easy and far less labour- intensive. That's why these pipes are cheaper than pipes with welded joints. There are two completely different ways of molding: the single layer method with the inner part cut-out (e.g. Drossbach lines) and the double-layer method patented by Corma, manufacturer of equipment for corrugated pipe production and used by other manufacturing companies. It is obvious that a single-layer pipe joint is significantly thinner and cannot guarantee the required stiffness and integrity. That's why the application of such joints in many countries is only approved for use with storm water sewers where leakage is not critical.

However, as practice has shown, molded double-layer joints have their disadvantages. First, molded joints have lower mechanical strength due to molding with the pipe. They cannot have greater wall thickness than the wall thickness of the pipe. And that is why it can't guarantee the required stiffness at bends and deformation

In-line socket molding, obvious disadvantages

of the pipelines – when the pipe joint will be bearing most of the load.

A thin walled joint can also loosen contact with the sealing ring during relaxation and cause leakage. There are technologies that "slow" the line during joint socket molding but they don't always ensure a consistently high level of synchronisation and repeatability. But the most important thing is that in-line socket molding technology / vacuum molding can't ensure fine inner diameter tolerance. Bigger tolerance can lead to seal failure. Welded sockets are manufactured by injection molding providing much finer tolerance.

Lower stiffness of molded sockets often leads to deformation, developing an oval or even square shape during improper transportation and storage on-site (which is quite common in Russia). In the best case scenario, it will make installation more difficult. In the worst case, it will reduce seal reliability and integrity.

Uneven cooling of a thinner socket and corrugated pipe will lead to stresses that make in-line sockets more fragile. This increases the risk of integrity failure during transportation, loading and installation at low temperatures. This problem is especially true of PP pipes which can crack at low temperatures, as a result of minor impacts during loading and installation.

A welded socket gives a better safety margin compared with a molded socket and it is the more popular option for Russia and CIS countries.

The world's leading producers of plastic pipes like Pipelife (Austria), Wavin (Holland), the POLYPLASTIC Group (Russia) use welded pipe joint technology. The POLYPLASTIC Group uses Corma equipment and has a license for molding joints but refuses to use this technology, preferring the more difficult, more labour-intensive option of socket welding. Welding is done in-house using an automatic mode which ensures total compliance with technology, reduces the operator's chance of failure to zero and ensures optimum quality and reliability of the pipe joints.

Molded joints often get deformation during improper transportation and storage

Many years of production and use of corrugated plastic pipes of different designs show that the POLYPLASTIC Group made the right decision.

Leaking in-line molded pipe joint during leak testing according to EN 13476-3

SUBTERRA:

SEEING A WELL-KNOWN EUROPEAN COMPANY IN A NEW LIGHT

Peter Vasilyev

Radius Systems, part of the POLYPLASTIC Group, acquired Subterra in June 2013. Subterra is a European leader of trenchless pipeline rehabilitation technologies.

Subterra was founded in 1985 and is uniquely skilled in the design and implementation of inspection and pipeline rehabilitation equipment. Today, Subterra has two workshops in Great Britain with over 30 units of special pipeline rehabilitation equipment.

Subterra's techniques have been used for water and gas pipeline rehabilitation all over the world, including: London, New York, Budapest, Shanghai, and Tokyo. The accumulated length of their restored pipelines exceeds 1000 km.

Subterra designed several pipeline rehabilitation technologies for various uses and, depending on the condition of the pipes, suitable for diameters up to 1800 mm. The most famous of their technologies are:

Rolldown

This technology was designed for the rehabilitation of deteriorated gas and water pipelines. The PE liner pipe is pushed through roller sets which reduce the pipe diameter concentrically, typically by about 7–10%. The pipe is retained naturally at its reduced diameter for a significant time. The pipe can be reduced on site during installation or can be prepared in-house beforehand. The liner is installed using the sliplining process, and the reduced diameter pipe is pressurised allowing it to revert to its original size, forming a close fit within the host pipe. The range of pipe diameters is from 100 mm to 500 mm, with nominal pressure up to PN16. Installation of up to 1.5 km in a single insertion is possible.

Subline

This technology creates a close-fit liner with an existing pipe and relies on partial structural properties of the host pipe. This method can be used for water and gas pipelines ranging from 75 mm to 1600 mm in diameter. The nominal pressure can be determined according to the pipeline properties.

Applicability of the method and thickness of the liner can be determined using graphs and charts. The SDR of the liner can be calculated using the size of the holes in the existing pipe and its operating pressure.

The PE liner (SDR 26–85 depending on diameter) is pushed through a former which folds it into the 'U'

shape. It is then held in place by PP or PETP strapping. Once installed, the folded liner is pressurised to snap the strapping. The liner reverts to its original size and forms a close-fit within the host pipe. The pipe-forming unit is positioned near the manhole. Long length installation up to 1 km in a single insertion is possible. Standard length is from 200 to 300 metres.

Subcoil

This is a similar technology to Subline. The pipe is folded into a 'U' shape in-house, strapped using film and delivered to the site. The maximal diameter is limited to 300 mm due to the necessity of coiling it onto the drum. Otherwise, the conditions of use and limitations are similar to Subline.

FastLine Plus

This is a polyurethane resin spray lining technology. It is used to provide an internal barrier coating or rehabilitation for water pipelines. As a result, the spray lining forms a smooth coating which improves the quality of water, prevents leaching, enhances the hydraulic properties of pipelines and prevents corrosion. The spray lining can be high and low build application. High build applications can overcoat existing holes (no more than 5 mm as a rule). Spray lining is fast-setting and the pipe section can be returned to service just two hours after application. FastLine Plus can be used for all types of pipes (including reinforced concrete) with diameters from 75 mm to 1800 mm. 200 metres can be lined in one pass. A number of pipelines in the Nizhniy Novgorod and Lipetsk regions were restored using this technology, including over 600 metres of pipelines from 1400 mm to 1800 mm at the Novolipetsk Steel Mill.

THE UNIQUE TESTING UNIT
FOR RAPID CRACK PROPAGATION

Larisa Soldatenko

The development of PE pipeline construction technologies has created an interest in seeing how pipes respond to an initiated rapid crack propagation at lower temperatures. Initially, crack tests on PE pipes were optional and then were included in ISO 4437 and EN 1555-1.2 for gas pipelines.

A unique testing unit for small-scale determination of resistance to rapid crack propagation (S4) of 400 mm pipes was installed at a testing laboratory at the POLYPLASTIC Group Klimovsk Pipe Plant in 2011. Previously there were only a few testing units for 160–225 mm pipes in CIS countries. Increased use of PE pipes up to 400 mm with increased operating pressures up to 12 bar has made such tests obligatory.

The idea for the unit came from I. Gvozdev and V. Biserov. The group of designers under the management of V. Biserov completed all the necessary calculations and drafted technical specification for the stand (under V. Gotovko, leader of the group). The production of structural components, assembling and commissioning was provided by a mechanical repairs shop at KTZ (S. Ermakov, Manager). This turned out to be a difficult task. The installation, commissioning and development of reliable results has taken over one year and required an investment of over 5 million rubles.

That is how the first and only Russian unit for small-scale determination of resistance to rapid crack propagation (S4) of 400 mm pipes was created.

The unit is numbered 01 and has a technical data sheet and manual. The State Regional Centre for standardisation and metrology of the Moscow Region has issued a Certificate No. AA 7018116 that confirms that “the stand for small-scale determination of resistance to rapid crack propagation (S4) belonging to the Klimovsk Pipe Plant has been approved for use during small-scale determination of resistance to rapid crack propagation according to GOST R 50838-2009, PE pipes for gas pipelines.”

The presence of this unit has made the use of PE pipes with gas distribution pipelines of medium pressure possible, after the S4 GOST R 50838 test changed from being optional to obligatory.

Currently, the testing laboratory of Klimovsk Pipe Plant (A. Senkovskiy, Head of the Laboratory) is conducting small-scale rapid crack propagation tests using DD GOST R 50838-2009. The pipes with outer diameters of 110 mm, 160 mm, 225 mm, 315 mm and 400 mm are being tested.

This unit is used for testing products made by the POLYPLASTIC Group and other companies from CIS countries, as well as for research works that study different types of PE pipe produced by local and foreign companies. In particular, it gives reliable data on highly popular PE types with high crack resistance (PE RC). The great wall thickness of the pipes (up to 36 mm) gives a comprehensive analysis of different types of PE crack resistance properties at low temperatures. This is particularly pertinent in Russia with its lengthy gas pipelines, where construction and repairs are often done in cold weather.

These units are still rare – not all European Testing Centres have them. Klimovsk Pipe Plant is therefore prepared to conduct testing for our European partners, producers of special types of raw materials, and pipe companies.

OBLIGATORY TESTING REQUIREMENTS LEAD TO THE CREATION OF A SPECIAL TESTING FACILITY

Andrey Senkovskiy, Larisa Soldatenko, Irina Knyazkina

A unique thermostatic bath has been put into use at the POLYPLASTIC Group's Klimovsk Pipe Plant. It's used to test pipes up to 2200 mm and fittings up to 1600 mm in diameter.

The bath was developed to help meet State Standards regulating requirements for plastic pipes and fittings. State Standards require resistance tests at constant internal pressure for a duration of 100 hours at 20°C, and 165 and 1000 hours at 80°C. Testing is conducted every two years for each diameter in the range.

Considering the demand for big diameter PE pipes, POLYPLASTIC Group companies now produce pressure pipe up to 1600 mm including gas pipes up to 1200 mm, low pressure (up to 0.6 MPa) and CORSYS PLUS pipes with inner diameter of 2000 mm.

A range of complex technical issues have been addressed to create an appropriate testing facility for pipes and fittings of such size. These include:

– Maintaining the required water temperature (bath capacity is around 40 m3). It is supported by an automatic system with temperature gauges, a water heating and cooling unit, and circulation pumps.

– Creation of constant pressure. It is supported by an IPT station (Germany). A special water preparation unit was designed and installed to filter out mechanical impurities and reduce water hardness.

–Installation of testing samples. For example, the weight of the 1200 mm pipe sample built with caps and filled with water is 7.5 tonnes. A special assembly procedure was developed to provide safe and effective use.

– Maintenance of the bath.

The thermostatic bath for big diameter pipes and fitting samples testing was manufactured and commissioned in 2012. It meets all the necessary requirements, and is now being used for a vast number of tests.

It is the only internal pressure testing unit in Russia, and one of the few in Europe on such a scale. It gives POLYPLASTIC Group the unique ability to verify the quality of all big diameter pipes and fittings through testing and compliance with appropriate regulations.

MEASUREMENT OF LINEAR THERMAL RESISTANCE OF PRE-INSULATED FLEXIBLE PIPES

Evgeniy Devyatkin, Igor Gvozdev, Dmitriy Gvozdev

Provision of data on the heat insulating properties of pre-insulated flexible pipe systems is required by EN 15632-1:2009 (E) [1] and TU 2248-001-48532278-2013 [2]. According to EN ISO 8497:1996 [3], measurements of linear thermal resistance are conducted in steady-state thermal conditions, usually on relatively short pipe samples, and requires minimisation or measurement of the heating flow in an axial direction. If the sample is sufficiently long, heat flow through its ends can be neglected. A simpler method for calculation of overall heat loss is based on measurements of average velocity of heat transferring fluid in the long pipe and the temperature at the pipe ends. The measurements are performed on an experimental setup of coiled ISOPROFLEX pipe under steady-state convection and radiation heat transfer conditions to the ambient air modelling pipe service conditions in the crawlway. Papers [4, 5] describe the method of measuring temperature dependence of the thermal conductivity coefficient using 18 metre pre-insulated pipe in 1.8 m diameter coils, conditioned in a water thermostat at about 17°C. Measurements were made in unsteady temperature conditions and one measurement was conducted within 10 hours.

Pic. 1. General view of the experimental setup

The general view of the experimental setup is shown in Pic. 1. It includes a closed circuit with circulating water; a section of the pipe without thermal insulation is placed in the thermal chamber and a section of the thermal insulated pipe is placed in the laboratory outside the chamber at room temperature.

Circulation of water is induced by a Grundfos UP 20-30 pump. Its volume flow is controlled by a KROHNE VA 40 flow meter and the temperature of the water is measured using K type submerged thermocouples M8 (chromel/alumel). 20 metres of pre-insulated ISOPROFLEX 25/63 pipe is used for testing, coiled into a 1.6 m diameter with a space between the loops of 0.1 m. The ambient temperature is measured using two thermometers placed at the top and bottom loop of the coil.

From consideration of the energy balance in the long pipe placed in air, the following equation for temperature of heat transferring fluid at the outlet of the pipe t_l can be derived (see e.g. [6]):

$$t_l = t_{air} + (t_0 - t_{air}) \cdot \exp\left(-\frac{l}{g\rho CR}\right) \qquad (1)$$

where t_0 – temperature of fluid at the inlet, t_{air} – ambient temperature, R – overall linear thermal resistance (value opposite to the heat transfer coefficient), g – volume flow of the heat transferring fluid, ρ and C – density and heat capacity respectively.

It was assumed in deriving the equation that R, ρ, C values don't depend on the temperature.

In case of practical interest $l/(g\rho CR) << 1$ temperature distribution of heat transferring fluid along the pipeline can be considered to be linear and the temperature drop in it Δt insignificant:

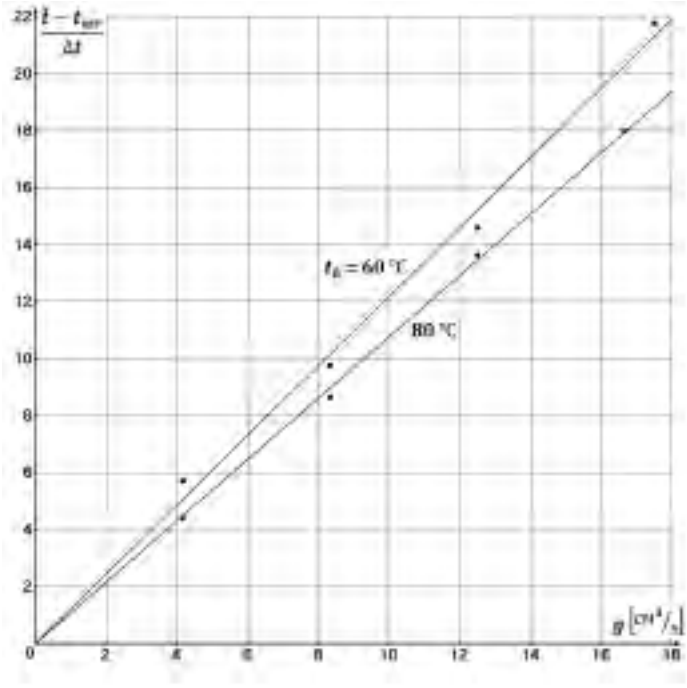
$$\Delta t = t_0 - t_l \approx (t_0 - t_{air}) \frac{l}{g\rho CR} \ll t_{air}$$

In this case, from the equation (1) we can derive the following approximate equation:

$$\frac{\bar{t} - t_{air}}{\Delta t} = \frac{\rho C R}{l} g \qquad \left(\bar{t} = \frac{t_0 + t_l}{2}\right) \qquad (2)$$

Therefore, experimental data represented in coordinates g and $(\bar{t} - t_{air})/\Delta t$, are described in linear dependence (2) beyond the immediate vicinity to the origin of the coordinates. This dependence can be achieved by equating the following two values for heat energy lost in the pipeline per second (heat flow rate) – $g\rho C\Delta t$ and $(\bar{t} - t_{air})l/R$, with the last expression being true for linear distribution of the heat transferring fluid temperature.

Pic. 2. Measurement results for two temperature conditions in the thermal chamber t_h = 60°C and 80°C



The results of measurements and calculations conducted for two temperature conditions t_h = 60°C and 80°C and 80°C at four values of heat transferring fluid flow are shown in pic. 2. The correlation coefficient for the obtained straight lines (their slope a is calculated using the least square method) equals 0.9993 for measurements at t_h = 80°C and 0,996 for t_h = 60°C. Overall thermal resistance is calculated using the following equation:

$$R = \frac{al}{\rho C} \qquad (3)$$

The above assumption about non-dependency of ρ and C from the temperature for the present tests is true as at the maximum observed heat transferring fluid temperature drop Δt = 10°C, the corresponding reduction in its volumetric heat capacity ρC is only 0,4% (data on temperature dependences of ρ and C for water see, e. g., in [7]).

The results of calculating R at l = 20 m and ρC = 4,1 · 10^6 J/(m³ · K) are shown in the table. Now we can calculate overall linear thermal resistance of pre-insulated pipe R_{pipe} and the average value of thermal conductivity of the insulation material in it, assuming that value R is known. Thermal resistance on the inner surface of the carrier pipe is usually ignored during pipelines thermal design calculations [8, 9]. Then, taking into account thermal resistances of the insulation R_i, carrier pipe R_f, casing R_c and resistance on the outer surface of the casing R_e, we have

$$R = R_{pipe} + R_e, \qquad R_{pipe} = R_i + R_f + R_c \qquad (4)$$

The above mentioned resistances are [8, 9]:

$$R_i = \frac{1}{2\pi\lambda_i} \ln\frac{D_{PUR}}{d_0}, \qquad R_f = \frac{1}{2\pi\lambda_f} \ln\frac{d_0}{d_0 - 2e}$$

$$R_c = \frac{1}{2\pi\lambda_c} \ln\frac{D_c}{D_{PUR}}, \qquad R_e = \frac{1}{\pi D_c \alpha_e} \qquad (5)$$

where D_c, D_{PUR}, d_0 – are outer diameters of casing, the insulation and the carrier pipe, respectively, e is the wall thickness of the carrier pipe, λ_i, λ_f, λ_c – are thermal conductivities of insulation, carrier pipe and casing materials, α_e is the heat transfer coefficient at casing outer surface.

As opposed to small longitudinal thermal gradient and temperature changes in pipelines in a steady-state, radial gradient and changes are great and, generally, require taking into account the temperature dependence of thermal conductivity when calculating thermal resistance of layers of pre-insulated pipes.

The heat insulating layer mainly contributes to the overall thermal resistance of pipes insulated with polymeric foams ($R_i >> R_{f,c}$, for ISOPROFLEX 25/63 it is about 98%) and in the first approximation we can assume that practically all temperature drop in the pipe takes place in this layer. Therefore, here and hereinafter λ_i is assumed to be a value averaged in the corresponding temperature range.

From equations (4) and (5) we get:

$$\lambda_i = \frac{\ln\frac{D_{PUR}}{d_0}}{2\pi(R_{pipe} - R_f - R_c)} \qquad (R_{pipe} = R - R_e) \qquad (6)$$

For ISOPROFLEX 25/63 we have d_0 = 25 mm, e = 2,3 mm and average values of the outer diameter of the insulation and casing are D_{PUR} = 59 mm and D_c = 63 mm

[10, 11]. For numerical calculations we take λ_f = 0,38 W/(m ·K) for PEX carrier pipe, λ_c = 0,43 W (m · K) for LDPE casing [11], α_e = 10 W/(m^2 · K) for a horizontal pipeline in an indoor environment and casing material with a high radiation heat transfer coefficient [9]. Thermal resistance values calculated from Equation (5) equal $R_f + R_c$ = 0,11 m ·K/W and R_e = 0,51 m · K/W whereas the corresponding values of R_{pipe} and λ_i got from Equations (6) are represented in the table.

Values λ_i given in the table are close to the corresponding average values of thermal conductivity determined previously from the results of measuring the temperature dependence of PU foam using an IZOMET 2114 thermal properties analyser with a measuring probe IPN 1100; at an average temperature of thermal insulation layer t_i = 40 °C the difference from the average value for tested samples of PU foam is about 7%, and at t_i = 46 °C it is practically the same. The table also gives absolute error estimates of indirect measurements of PU foam thermal conductivity $\Delta\lambda_i$ at confidence probability 0.95.

Thus, the proximity of calculated PU foam thermal conductivity values to those previously measured using IZOMET 2114 shows the possibility of measuring thermal resistance of coiled pre-insulated pipes at ambient temperature in a steady-state condition.

The results of calculations of linear thermal resistance R, Rpipe and thermal conductivity of PU foam λi for pre-insulated flexible pipe ISOPROFLEX 25/63

t_h, °C	$\tilde{t}$, °C	$\tilde{t}_i$, °C	$\alpha \cdot 10^{-6}$, c/m^3	R, m ·°C/W	R_{pipe}, м ·°C/W	λ_i, W/(m · °C)	$\Delta\lambda_i$, W/(m · °C)
60	53	40	1,22	5,95	5,44	0,026	0,002
80	67	46	1,08	5,27	4,76	0,029	0,001

References

1. EN 15632-1:2009 (E) District heating pipes – Pre-insulated flexible pipe systems – Part 1: Classification, general requirements and test methods.
2. TU 2248-001-48532278-2013 ISOPROFLEX-115A with PU foam insulation in corrugated PE layer.
3. EN ISO 8497:1996 Thermal insulation – Determination of steady-state thermal transmission properties of thermal insulation for circular pipes.
4. Reidhav C., Claesson J. A transient method to determine temperature-dependent thermal conductivity of polyurethane foam in district heating pipes. The 8th Nordic symp. on building physics, Copenhagen, Denmark, 2008.
5. Reidhav C., Claesson J. Transient thermal conductivity of flexible district heating twin pipes. The 12th Int. symp. on district heating and cooling, Tallinn, Estonia, 2010.
6. Kopko V. Thermal insulation of heating pipelines. Minsk, Tekhnoprint, 2002.
7. Volkov A., Zharskiy I. Great chemical reference book. Minsk: Modern School, 2005.
8. Ionin A., Khlybov B., Bratenkov V., Tereletskaya E. Heating supply, M.: Stroyizdat, 1982.
9. SP 61.13330.2012 Thermal insulation of equipment and pipelines.
10. TU 2248-021-40270293-2005 ISOPROFLEX and ISOPROFLEX-A PEX with PU foam thermal insulation in PU corrugated layer.
11. ISOPROFLEX. Technical specification. Flexible pre-insulated pipes for district heating and hot water supply. POLYMERTEPLO Group 2007.

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POLYPLASTIC GROUP

SCIENCE-DRIVING ALTERNATIVE

PLASTIC PIPES BECOMING MORE POPULAR THAN METAL ONES IN HOUSING, UTILITIES AND OTHER INDUSTRY SECTORS

Plastic pipes are improving their position in the market – a fact acknowledged by competing metal pipe manufacturers. The most advanced metal suppliers are now including plastic pipes and fittings in their catalogues. Metals of Eurasia International industrial magazine published the following interview with Miron Gorilovskiy, Director of POLYPLASTIC Group, in Issue No.1 of 2013.

– Your company is a great example of the development of a science-based business using in-house innovations to target complex areas such as housing and utilities. How was the POLYPLASTIC Group created, and how was your choice of direction made?

– POLYPLASTIC Scientific and Production Enterprise was registered on 19 August 1991. The main activities were composite materials production and plastics processing. This is because we, the founders of the company, were working at PLASTMASSY Scientific and Production Corporation and were professionally and passionately involved in these issues. Production of polymeric composites in USSR did not exist but there was a great need for it. We planned to fund our main business by plastics processing which was very profitable at the time.

We rented molding machines that were on standby (most of the equipment then was unused) and started production of various things – hangers, clothes pegs, fly swatters etc.

Of course, the idea of creating our own science based production seemed crazy. The inflation was 100% per month! However we were lucky enough to meet the right people. Our initiative and enthusiasm attracted the attention of prominent specialists from NII Plastmass (Plastics Science and Research Institute) like Vladimir Tochin, Igor Aizinson and Eugeniy Artsis. It is thanks to them we achieved our own formulations and trademarks for the polymer composites that are widely used in different sectors today.

We started cooperation with large plants such as Stavropolpolymer (Budennovsk), Sintezkauchuk (Togliatti) and Ufaorgsintez, Polypropylene (Atyrau, former Guriev, Kazakhstan) which were standing idle with no funds, raw material resources and no markets. We sourced and paid for raw materials including monomers, straight-run naphtha and propane-propylene fraction. We then paid for delivery to the plant and processing, into ready plastics, part of which are used for composite material production. It could be said that we saved several companies from closure. For example, the Atyrau plant received all

raw materials from us for 5 years, which was almost 2.5–3 thousand tonnes per month. In fact we were a system integrator of the polymeric industry of the former USSR. The processing business gave us a significant income, part of which was used for investment projects.

We started manufacturing in 1993 at the rubbish disposal site in Ochakovo, Moscow, near the heating power station and the small AND Gaztrubplast Plant. The plant manufactured plastic pipes and was in a poor state: lines were not working to their full capacity and employees had been laid off for 6 months. We bought this plant 2 year later and began new business activity. We understood that it was a prospective business and much work was required, especially as customers were not too sure about plastic pipes even though they had many advantages. Since then we have constantly educated about plastic pipes and continue to fight the 'metal lobby'.

By 2002 our pipe production activity was so successful that we began to build new plants.

Klimovsk Pipe plant was one of the first plants. Today it is the largest and one of the most modern plants in Europe. A number of plants were opened in other regions of Russia, Ukraine, Belarus and recently in Kazakhstan. Currently there are 12 plants producing pressure and non-pressure pipes, fittings and PE manholes. We also have trade houses and representation offices ensuring smooth delivery of everything required for PE pipeline construction.

Our composite activity is also successful. Our production capacity allows us to make 80 thousand tonnes of polymer composite materials per year. Production is based in 3 locations – Moscow (Ochakovo), Saratov (Engels) and Samara (Togliatti). Our polymeric composite materials range is very wide and meets the requirements of a range of home industries.

– What is the production structure of the Group and what is your place in the market?

– The Group operates 15 plants in total. Ten plants produce PE pipes for gas, water and sewerage, as well as CORSYS type pipes for HDPE pipelines. Two plants, AND Gaztrubplast and BelPOLYMERTEPLO, produce flexible insulated pipes for heating systems, a unique product with no alternatives in Russia. Three enterprises are working in composite materials production. Nine trade houses and branches provide sales. There are also two research and de-

velopment centres dedicated to composite materials and pipes, a training centre and a design institute.

The Group has processed over 300,000 tonnes of polymers and sold over 230,000 tonnes of pipe products within the last year including about 1000 km of flexible insulated pipes and over 70,000 tonnes of polymeric compounds. The major consumers of pipes are the companies working in the housing and utility sector, contractor companies to Gazprom, and construction companies working on large Federal projects (construction in Sochi, APEC summit and others). Composites are used in many sectors. We have developed new generation materials with enhanced durable properties (modulus of elasticity, impact resilience etc.), frost resistance, stable shrinkage, and special properties (low emissivity level, high scratch resistance etc.) for the car industry. These are not only used for domestic car manufacture but also by foreign manufacturers such as Ford, Volkswagen and Renault. Special types of low combustible polyamides are successfully deployed in electronics components including Schneider Electric products. Polypropylene based materials are widely used in construction finishing materials and components of household appliances produced in Russia by Indesit, LG, B/S/H (Bosch–Siemens), Beko, Vestel and Candy.

Our pipes are produced using certified pipe (light-stabilised) grades of PE 80 and PE 100 made in Russia and abroad. Composite enterprises mainly use home raw materials (PP, PA-6) and imported additives-modifiers.

The combined turnover of POLYPLASTIC and POLYMERTEPLO in 2012 was around 30 billion rubles. Plastics processing is not a very profitable business compared to the oil and gas industry (our standard EBITDA profit is 8–12%) but stability and great growth potential make it very attractive.

– How strong is the competition between plastic pipes and metal ones and how do the main performance properties compare e.g. operational properties, quality, price, maintenance and supply lead time?

– The advantages of plastic pipes have been well known for a long time. They are resistant to corrosion and most aggressive chemical compounds found in the pipelines and have great hydraulic properties. Because of these properties the pipes serve longer – at least 50 years. Plastic pipes are easy to install and more reliable in operation because they are abrasion resistant and don't fail when frozen. The cost of PE pipes in the most popular sizes (up to 630 mm) is cheaper than metal ones. If you compare the "pipeline in the ground" prices including operating life, maintenance and repairs rather than the price per lean metre, the difference becomes very obvious.

Of course currently there is no alternative to metal pipes for oil, gas and heating pipeline construction in big diameters with high pressures and high temperatures. I would say for the time being, there are new materials and technologies emerging and polymers today are used where it was impossible to imagine even a short while ago. No one wanted to hear about PE gas pipelines 20–30 years ago but now PE pipes have almost replaced steel pipes in gas infrastructure development projects. A similar situation occurred in the heating supply industry. 10 years ago after a big effort, we started to deploy PEX pipes in distribution networks and today they are used for the modernisation of heating pipelines in large cities. We can offer pipes that withstand 135°C at 10 bar, which was impossible 10 years ago.

– Can mass implementation of plastic pipes solve the problems of the housing and utility sectors and make network operation more reliable and safe?

– There are about 500,000 kilometres of water pipeline in Russia; heating pipelines – 250,000 kilometres, gas pipelines – 300,000 kilometres. The rate of wear of the utility pipeline networks is estimated at 80% with over third of the networks needing immediate replacement. The rate of aging of the existing pipelines is higher than the rate of their renovation, which means that it is time to

talk about their complete degradation. Modernisation at such an enormous scale cannot be achieved by just using steel pipes, at least technically.

In most of the cases, the rate of construction or renovation of the pipelines using plastic pipes is significantly (sometimes several times) higher than traditional renovation. It is possible to increase the rate of renovation per construction season. Our Group goes further offering a completely different solution to the problem of modernisation project financing by offering housing and utility companies a long-term credit repayment achieved through the savings made: emergencies are stopped and there is no need to pay for extremely expensive emergency repairs. The scheme has been tested in 15 cities, villages and rural settlements and showed good results.

– Does research and development still play big role in the Group's activity?

– Both our composite and pipe divisions are science based. One of our research and development centres provides science based production of polymer composites, development of the formulations, selection of raw materials, quality control (of materials and final products), and resolves many other polymer chemistry issues. The other centre develops new types of pipes, improves production processes and creates the necessary regulating documents. The effectiveness and significance of these two departments is very obvious to us. It is thanks to them that we have developed and implemented a wide range of composite thermoplastic materials for different purposes – over 350 types and modifications, including 90 coloured materials. We launch new types of pipes every year and most of them don't have analogues in Russia. Coordination of the two Research and Development Centres and production allows us to enhance the efficiency of pipe production. We also plan to create a Research Institute at the Research and Development Centre with wider fundamental research and processing tasks.

– What are the prospects for industrial use of polymer composites?

– The consumption of polymer composites per capita in Russia is 3–5 times lower than in developed countries. This is due to underdeveloped car manufacturing, production and goods and other industries using special plastics. All these industries will eventually develop further.

– Does the industry which POLYPLASTIC Group works in need government support?

– This question has been answered with the comments about the need for tougher standards and material requirements in the housing and utility sectors. Clearly, we support it but generally nothing should be prescribed to anyone except the cases related to the safety and welfare of the people. The housing and utility sector needs new principles of governmental participation. No one is interested to safe funds under the current subsidising model. Why would the head of a heating supply company deploy resource-saving technologies, or care about return on investment if he gets irrevocable governmental funding? He is only interested in inflating his repairs budget. It is time to switch the industry to modern economic relations with long-term repayable credits. The housing and utility companies will then have no choice but to switch to modern technologies that ensure long-term cost-effectiveness.

– POLYPLASTIC Group most definitely has a strategic development plant. What are the main priorities?

– The Group's development programme is aiming for a long-term 10–15% per year production increase with a presence in all regions of Russia, Ukraine, Belarus, Kazakhstan and other CIS countries. The strategy is also integration (at reasonable scale) with the leading European producers to attract the best experience and technologies and their deployment in the post-Soviet area.

Our long-term priority is to increase our share of innovative and highly efficient products of our own design and implementation into the world's advanced technologies.

ST. PETERSBURG

WILL GET THE MOST MODERN AND RELIABLE UTILITY NETWORKS

Mikhail Shleyev

Construction of the new international Exhibition and Convention Centre (ECC), designed to host any scale of European and global business event, is one of the largest projects currently underway in St. Petersburg. This project is being implemented as part of the framework of Cooperation and Coordination Agreement signed by the Government of St. Petersburg and Gazenergoprombank CJSC on 9 February 2007. Expoforum CJSC was created on 18 January 2008.

ECC is situated on a 56.21 hectare site in the Pushkinskiy District of St. Petersburg, near Pulkovo Airport. The project includes the construction of open and indoor exhibition areas, a congress centre for 7000 people, the main hall for 3000 people and the gala events hall for 2000 people. There are two premium hotels, a business centre and additional infrastructure and facilities, including warehouses, customs terminal, coffee shops and restaurants. The reconstruction of Peterburgskoe Shosse includes the construction of several transport interchanges and road networks in the surrounding area to ensure easy access to the Exhibition and Convention Centre.

Avangard Engineering – the exclusive partner of POLYPLASTIC Group in St. Petersburg and the Leningrad Region – has become a general supplier of materials for external water supply and water disposal systems. Expoforum CJSC has chosen the company because of their excellent quality products and prompt technical support throughout the process, including calculations, drafting the operating process chart, and consultations on appropriate product selection for the project.

Aikon LLC, MNR-1 LLC, SMU No. 9 LLC are overseeing the installation of utility networks.

CORSYS pipes from 110 mm to 1200 mm with various ring stiffness (SN8 and SN16) were supplied to all sites. The selection of the ring stiffness was undertaken by Avangard Engineering, together with technical specialists from POLYPLASTIC Group, based on the ATV-DVWK 127 standard: Static calculations of drains and sewers.

MULTIPIPE II two-layer pipes, PAS 1075, made at the Klimosvsk Pipe Plant, were supplied for the most crucial parts of the water supply system. Their outer layer is made of the new generation materials, PE100RC, which have increased crack resistance. These pipes ensure increased mechanical impact-resistance during construction and operating, therefore providing reliability and durability.

The opening of Exhibition and Convention Centre is planned for the 2nd quarter of 2014. It will be one of the largest centres in Europe.

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BACK FROM "BEYOND REPAIR"

CORSYS PLUS HAS PROVED ITS RELIABILITY

Vladislav Tkachenko

Specialists from the POLYPLASTIC Group were invited to visit a construction site of a 3 km sewer pipeline made of CORSYS PLUS pipes (D: 2200 mm).

It had been discovered that one of the sections, about 300 metres out of the total length of 3 km, had an unacceptable level of ovality. In some places it reached 20% and could go beyond that given the movement of the heavy construction machinery above the pipeline.

The cause of the section deformation was obvious: the contractor did not follow their requirements for backfilling, ground compaction and earthfill. It could have been one of several contractors who had been involved in the construction project since 2010.

After inspection, specialists from the POLYPLASTIC Group concluded that all the pipe joints had maintained their integrity and soundness, despite the critical deformation during the last 1.5–2 years.

The operating company refused to accept the faulty section of the pipeline. So the customer and the general contractor decided to remove the entire backfill and eliminate pipe ovality with subsequent backfill.

The POLYPLASTIC Group offered a simple and effective solution to eliminate the ovality. Adjustable wooden jacks were installed inside the pipe. The vertical diameter of the pipe was restored to the standard value with lateral wooden planks. Then the layered backfill and compaction was undertaken to standard requirements. The jacks were removed after the backfill.

Control checks of pipeline ovality were conducted one month after completion of the work, in the presence of representatives from the POLYPLASTIC Group, the design company, the customer and the contractor. The tests showed ovality was no more than 0.5% and the pipe joints had retained their integrity.

CORSYS PLUS pipes have demonstrated their high flexibility and reliability once more by withstanding process violations and subsequent restoration.

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ISOPROFLEX-ARCTIC PIPES ARE NOW USED FOR PASSENGER CARRIAGES WATER FILLING PIPELINES

Peter Andreev
Nizhegorodzheldorproekt, Roszheldorproekt OJSC branch
Lev Rakhmanov
SKB Infotrans CJSC

The implementation of a pilot project for rehabilitating water filling pipelines for passenger carriages, using automated fueling systems, has begun at Agryz station, Gorkiy Railways in 2011.

Water filling lines were designed by the Nizhegorodzheldorproekt Design Institute, Roszheldorproekt OJSC branch in Nizhniy Novgorod. The automatic filling systems (SAZ-1) designed by SKB Infotrans CJSC were used in the new lines.

Automatic filling system provides filling of passenger coaches with water. When the hose is connected to the filler neck of the carriage, pressing of START button on the system's control panel initiates filling. If the carriage is equipped with a restriction valve, the system limits the water supply and automatically pumps out water from the hose. A signal indicating completion appears on the control panel as soon as the pumping is finished. The hose can be disconnected and spooled back automatically.

This system eliminates water loss when filling carriages. It also prevents hoses from freezing during the winter. Moreover, it reduces the amount of time taken to fill carriages, thereby simplifying the whole process. It is

possible to fill 22 carriages within 14–20 minutes.

ISOPROFLEX-ARCTIC insulated pipes, sizes 50/110 mm and 110/200 mm, produced by Cheboksary Pipe Plan (part of the POLYMERTEPLO Group) have been used for the inlet and return pipelines. These pipes feature excellent polyurethane foam, with cable channels designed for self-controlled heating cables like the 33HTP-BT. This allows installation of pipes at a shallow depth (0.7 metres deep in this case) and it reduces construction costs. The pipe heating system also eliminates water freezing during the winter.

The SAZ-01 system elements – the filling stations and hoses, the electromagnetic valves, and the electric pump for pumping excess water – are placed in the heated containers. The containers are heated by electric heaters which maintain the temperature at about +10°C. The temperature in the pipes is set at +4°C to avoid freezing.

Filling stations measure half the length of a carriage and are placed every 25 metres along the platform.

The first SAZ-01 automated filling system was commissioned on 2 November 2012 at the 4th Platform of the Argyz Station. The second one was put into operation on the 28 February on the 2nd Platform.

The results of the winter operation of the filling pipelines have proved the reliability of the system. Water filling has been carried out at –35°C, and there have been no delays and no filling station malfunctions reported.

Nizhegorodzheldorproekt Design Institute and SKB Infotrans CJSC have been asked to design a unified project for a filling line to be implemented at the Russian Railways. Use of ISOPROFLEX-ARCTIC insulated PE pipes will ensure stable operation, even in severe weather conditions.

THE FIRST PIPE CONFERENCE FOR CHILDREN

Marina Kuzmenko

The First Children's Pipe Conference, dedicated to International Children's Day, was held at the POLYPLASTIC Group on 31 May 2013.

25 children – all sons and daughters of POLYPLASTIC Group employees – aged from 6 to 13, took part in the conference.

Just like any other conference, participants needed to register on arrival. Everyone was given a badge, and welcomed with tea, juice and freshly-baked cakes.

The conference started with some theory and a presentation from the POLYPLASTIC Group. The children were shown a film about the role of

water in human life – and told about the importance of saving water. They learned about the history of water pipelining and the creation and development of the pipe market. They also heard about the range of plastic pipes and their advantages, and got a quick guide to the products and materials produced by the group. The whole production cycle, from production processes, through installation to delivery to the customer was explained in very a simple and engaging way.

The next presentation, from the POLYMERTEPLO Group, told an interesting and engaging story about pipes for hot water and heating, their classification, use and installation. The presentation was followed by a demonstration of an ISOPROFLEX-A pipe installation.

The children were very serious about the conference: they watched the presentations, listened carefully, made notes and answered all the questions together. Just like adults, they asked plenty of good questions during the panel discussions too. They learned about the differences between metal and plastic pipes and understood the advantages of plastic "because water purity and its saving in our houses depend on it." The most active participants were given prizes.

Arguably the most interesting part came next – a practical study of pipe connection technologies. The participants were split into four groups on four sites (pipe cutting, butt welding, electrofusion, and compression fittings). The groups were given a flag and moved to another site upon completion of each stage.

The children were shown the pipe cutting tools for different diameters, from 20 mm to 110 mm, and were given the task of cutting a 32 mm pipe for the following stage. Then they had to use their cut section to make

the shape of a number using compression fittings. All groups did a great job and made the number 2013 – the year of the First Children Conference.

They were given a demonstration of the welding machine and were even allowed to press buttons, cut the pipe edges and weld the 315 mm pipe. All the leftovers, cuts and shavings, were taken as souvenirs.

Every group got four flags each and even after the practical lesson was finished no one wanted to leave. They had to be encouraged so they weren't late for lunch!

After lunch at the Business Centre, they went to the AND Gaztrubplast Plant to visit the R&D Centre and the POLYPLASTIC Research Institute.

They visited two laboratories – thermal analysis and rheology of plastics. There they were shown some of the instruments used for plastics behaviour research during heating and cooling, they learned how to use optical microscopes and were allowed to look at fingerprints, coins, and a drop of ink on the paper. The classic experiment of instantly freezing a rose in liquid nitrogen made a particularly strong impression.

The conference participants were told about composite materials at the R&D Centre, and they were shown the lab, where they could see the extrusion and forming machines used for plastics processing.

The children were very excited about the last task of the day – to draw a picture showing the pipe production process. They drew pictures together and by themselves. All the pictures made a great story about their visit to the plant and contained kind and sincere messages to the POLYPLASTIC Group.

The conference participants received gifts and certificates for "passing the course for young plastic pipes

specialists" and then launched some balloons to celebrate.

The event was full of positive new experiences. All the children were active, mindful and curious, they made friends and were very relaxed. They learned new things and had a good time.

The parents said that they were talking all about pipes during the weekend and that they asked them many questions.

We're sure the children will grow up to become hardworking employees; most of them have already said they'd like to work for POLYPLASTIC. We hope they'll remember their trip with fondness for a long time to come.

The event organisers certainly had a great time with the children. And we hope that this event will become a great tradition in the POLYPLASTIC calendar.

VLADIMIR SHUKHOV
PIPELINES AND WATER TOWERS

Sergey Arssenev

Russia commemorated the 160th Anniversary of Vladimir Shukhov, a great engineer, architect, inventor and scientist, who made an outstanding contribution to the construction technologies of water towers, tanks and pipelines. He was the designer and technical project supervisor of Russia's first oil pipelines and facilities. Shukhov also used his development expertise in water supply projects in many Russian cities

Vladimir Shukhov was born on 28 August 1853 in Grayvoron near Belgorod. He graduated from Imperial Moscow Technical School (currently Bauman Moscow State Technical University) in 1876, and completed an internship in the USA. In 1878–1879 Shukhov designed and constructed Russia's first three 3-inch oil pipelines. These were 9 km to 12 km long and connected the Balakhany oil production site with oil refinery plants in the outskirts of Baku. Shukov also invented several types of oil pumps.

In 1878 Shukhov designed and constructed the first cylindrical reservoirs / oil storages for the Baku oil production sites. Before Shukhovs's reservoirs, oil was stored in drums and ponds and polluted the environment and soil. At the end of XIX, oil and oil products in the USA and Europe were stored in square tanks. The construction office of Alexander Bari, where Shukhov was a Chief Engineer and a business partner, had built over 20,000 cylindrical reservoirs. Nowadays there are hundreds of thousands of reservoirs built all over the world using Shukhov's design.

Shukhov was a designer of Russia's first main pipelines: Baku–Batumi (first project design – 883 km) and Grozniy–Tuapse (618 km).

Vladimir Shukhov developed a classical pipeline theory based on his practical achievements and some of the ideas are still relevant today. He gave exact mathematical formulae to describe oil, kerosene, residual oil and water flow in his "Oil pipelines" article (1884) and in the "Pipelines and their application in the oil industry" book published in 1895. This is the foundation of basic pipeline hydraulics.

The greatest invention of this engineering genius was the world's first industrial oil cracking plant (thermal cracking process, patent of Russian Empire No. 12926 dated 27 November 1891).

Shukhov's triumph was in 1896 at the largest pre-revolutionary All-Russia Exhibition of Industry and Art in Nizhny Novgorod. For this exhibition he built the world's first exquisite steel grid shell water tower in the shape of a single-cavity hyperboloid rotation.

Hyperboloid was a completely new and previously unused shape in architecture. After that first design, hyperboloidal designs were adopted by a number of famous architects including Antonio Gaudi, Le Corbusier and Oscar Niemeyer. Shukhov's design was also used for the construction of eight gigantic pavilions with arch-type steel shell roofs covering an area of 25,070 square metres. Similar structures appeared abroad only thirty years later and are still being used.

The same year, Shukhov was granted a patent for his original, highly efficient and safe vertical and horizontal steam boilers. In 1900 his steam boilers were awarded a gold medal at the World Exhibition in Paris. By the 1950s, these were being produced in Russia in the thousands.

In 1898, as a result of the development of the first science based project for the Moscow water network system, Russian universal methods for water piping calculations was created by V. Shukhov, E. Knorre and K. Lembke.

Shukhov designed over 30 marine mines during WWI, designed and built floating bateau portes, and created a mobile platform for long-range guns. All Vladimir Shukhov's military inventions were highly praised by marine and acting forces.

Vladimir Shukhov died on 2 February 1939 aged 86 and is buried at Novodevichy cemetery in Moscow. A monument commemorating this great engineer, architect and academic was unveiled on 2 December 2008 at Sretenskiy Bulvar in Moscow. This monument was a gift from LUKOIL to the city of Moscow.

Shukhov water towers

Vladimir Shukhov's part in the development of Russian water pipelines began the moment he created the hyperboloid steel grid-shell water tower. At the end of XX, the construction of water pipelines had begun in many cities of Russia and Shukhov had to find a way to radically improve existing water towers.

There is a legend that Shukhov was impressed with the durability of woven willow baskets. From 1895, after analysing the design of the basket, he calculated that the most optimal and durable vertical shape is a grid-like

The world's first hyperboloidal design Water tower. Nizhniy Novgorod, 1896

single-sheet hyperboloid formed by straight steel guide rods and connected by steel rings. He began testing a model water tower erected in the yard of the Bari plant in Moscow.

The model was used to work out the design parts and different methods of production and installation. The testing model did not exist for long – but as a result of testing, the first industrial sample hyperboloid water tower impressed home and foreign specialists at the All-Russia industrial and arts exhibition in Nizhniy Novgorod in 1896. The total height of the tower was 37 metres and the height of the support hyperboloid from the foundation to the bottom of the reservoir was 25 metres.

The world's first hyperboloid design was incredibly beautiful. The famous patron of art, Yuri Nechaev-Maltsov, who gave the Museum of Fine Art to Moscow (presently Pushkin State Museum of Art) bought the first hyperboloid after the Nizhniy Novgorod exhibition. The tower was dismantled and rebuilt by the palace of Nechaev-Maltsov in Polibino Village (presently Dankosvkiy District of Lipetsk Region) under Shukhov's supervision.

The tower has been standing near the palace of Nechaevs for over 114 years but now requires anticorrosion protection and partial restoration of the water reservoir and the basement. The hyperboloid's framework is still in a satisfactory condition.

Shukhov created a calculation method for grid-shell hyperboloid towers and a universal metal installation layout system, and found an easy and simple form of a graphic design which made drawings easier to read, not only by engineers but also by middle technical personnel. Shukhov widely used standardisation and standard designs for water towers.

In the beginning of the XX, Shukhov's grid water towers started to become more popular than previous standard tower designs. They were considered cheaper, more robust and more aesthetically pleasing. Even the most basic water towers from the first half of the XX were 1.5–3.5 times more expensive that Shukhov hyperboloid water towers.

"The hyperboloidal grid-shell designed by Engineer Shukhov currently presents such a perfect type of metal tower that their timely application for water supply, railways and cities would have saved an enormous construction capital..." said engineer D. Petrov in 1911 in his book "Metal water towers. Their significance, design and calculation".

Over 200 of Shukhov's hyperboloid water towers were built in Russia and USSR during his lifetime – a third of them with his involvement. The rest were installed by other companies using Shukhov's standard project plans sold by Bari's company.

The water towers for city water pipelines in Kolomna and Efremov (1902), Nikolaev (1906–1907), Kharkov (1912), Priluki (1914) and Voronezh (1915) were built under Shukhov's immediate supervision.

A great number of hyperboloid water towers were built by different companies all over the country including Lisichansk (1896), Yaroslavl (1904), Andizhan (1909), Kokand (1910), Khimki (1912), Kazan (1914), Tsaritsyn (1915), Lugansk (1915), Samara (1915), Shostka (1916) and Okhta (1916).

Over 40 Shukhov water towers were built for Russian railways. Vladimir Shukhov suggested a non-standard design for Yaroslavl station. The 9.5 metre tower consisted of two hyperboloids installed one on top of the other. These hyperboloids were connected by a single ring. Each

carried a reservoir: the top one was 200 м3 for fire purposes and the lower one was 120 м3 for the courier trains water supply. The total weight of the tower with both reservoirs was 66 tonnes. Built in 1911, this was the first multi-level hyperboloid tower. The experience was then used in Moscow in 1919–1922 during the installation of a multi-level 150 metre radio tower which consisted of six hyperboloids.

Shukhov's drawings, old pictures and calculations for hyperboloid water towers, reservoirs and water pipelines are archived at The Archive of the Russian Science Academy (fund 1508, ref. 1), Russian State Archive of Scientific Technical Documentation (RGANTD, Fund 166, ref. 1). RGANTD Fund stores unique full volumes of documentation on hyperboloid water towers in Ivanovo-Voznesensk (1924), Orekhovo-Zuevo (1924), Vologda (1930) and Evpatoria (1926) which show the exact design technology and construction of Shukhov water towers.

Only five of Shukhov's water towers have survived in Russia. These are the first hyperboloid tower (1896) in Polibino Village of Dankovskiy District of Lipetsk Region, and the Shukhov towers in Vologda, Ivanovo, Petushki and Lobnya (Lugovaya station). There are also towers without the tanks in Krasnodar and Vyksa. All these unique structures need anticorrosion protection and restoration. There are also a number of Shukhov towers still standing in other CIS countries.

Moscow water supply project

Construction of Moscow's first water supply system began at the end of XVIII by the order of Ekaterina the Great. Water was previously supplied by water carriers, however this was unacceptable for fire protection. The first Moscow gravity pipeline was built in 1804 and carried water from Mytischi district via the Rostokinskiy aqueduct. By the middle of XIX, its capacity was not enough to supply the city. There also was a need for fire pipelines able to supply water to the upper floor of buildings.

In December 1885, thanks to the initiative of Governor Nikolay Alekseyev, the City Duma took the decision to construct a new city water supply system. Initially they invited foreign specialists to help: British man Lindley and Belgian Verstraten, however their projects were rejected due to technical and economic reasons.

N. Alekseev then asked the Construction Office of Bari to design the Moscow water supply. Shukhov was the Chief Engineer and had experience in pumping and pipeline construction. By that time Shukhov had taken part in the design and construction of water supply systems in Kuznetsk, Syzran, Zhitomir (1883), Buzuluk,

The same Water tower in Polibino village. Lipetsk Region, 2014

Samara, Serpukhov, Odessa (1884), Kaluga, Nakhichevan and Tsaritsyn (1885). He was famous amongst the specialists owing to the Tambov water supply project (1883) which he designed in collaboration with N. Zimin upon the order of the head of local administration. The project supplied of 60,000 buckets of water per day.

Shukhov and his assistants, E. Knorre and K. Lembke, worked on the draft project for the Moscow water supply for about two months. According to the design, the water intake was planned in the Mytischi district near Moscow. N. Alekseev, Head City Administration, and the Moscow City Duma, approved the project as it was considered to be economically effective and in compliance with the Duma's technical requirements.

Shukhov and his employees conducted geological and hydrological research from August 1887 to March 1888. This showed that the area surrounding Mytischi was not

The water tower in Lugovaya village (Moscow Region)

able to supply even the half of the water required (3.5 million buckets per day). The decision was therefore taken to install an additional water intake in the upper reaches of the Yauza River near Bogorodsk.

As a result of his research and watershed data analysis, Shukhov developed a theory of groundwater for the Yauza basin. All survey works were completed by the end of March 1888. The final project for the Moscow water supply prepared by Shukhov, Knorre and Lembke was sent for approval in June. Calculations for the pipelines and reservoirs were conducted based on the optimal balance of structure durability and construction costs. During the design of the Moscow water supply, Shukhov applied the principles for pipeline construction and hydraulic systems he developed back in 1878–1879 for the construction of Russia's first oil pipelines in the Baku oil fields.

The project was approved by the Ministry of Transport in February 1889. However, the Temporary Moscow Water Pipeline Inspection Committee subsequently demanded a reduction in funds for the construction and cut the scope of work in June 1889.

The new project, designed by city engineers Zimin, Zabaev and Dunker was based on hydrological research and Shukhov, Knorre and Lembke's project and was approved for implementation.

The new Mytischi water supply system began operation in October 1892.

The approved project reduced capacity from 3.5 to 1.5 million buckets of water per day and the estimated cost was reduced by 857,800 rubles (4,957,800 from the Shukhov plan and 4,100,000 from Zimin's). Once the Mytischi water pipeline construction was complete, the need to increase the water supply to 3.5 million buckets of water per day soon arose – as already suggested by Shukhov, Knorre and Lembke. An additional 2,250,000 rubles was then spent to upgrade the water supply five years later.

Shukhov was needed again for the implementation of the corrected plan. His design was used by the Bari Construction company who worked as a contractor in Rublevskaya pumping station and supplied riveted tanks for the Krestovskie water towers.

Shukhov was awarded a gold badge for his part in the creation of the Moscow water supply system. He was also an active participant in the First Russian Water Congress held in March 1893 in Moscow.

The project and the supporting research undertaken by Shukhov, Knorre and Lembke created so much interest in technical circles that three years after their publication by Moscow city administration, the Bari Construction Company had to publish a new edition which also contained the theoretical articles developed by the authors. Shukhov's project for the Moscow water pipelines is archived by the Russian Academy of Science.

Sources:

1. V. Shukhov, Oil Pipelines. – Industry Bulletin, No. 7, Moscow, 1884.
2. V. Shukhov, Pipelines and their application in oil industry. Publications of the Polytechnical Society, Moscow, 1895.
3. V. Shukhov, Pumps of oil wells and mines, calculation. Archive of Russian Science Academy, f. 1508.
4. V. Shukhov, Tambov water supply system. From Construction office by A.Bari, Moscow, 1883.
5. V. Shukhov, E. Knorre, K. Lembke, Moscow water supply project, Moscow City Administration, Moscow, 1888.
6. Water towers of Engineer Shukhov, Construction office of A. Bari, Moscow, 1914.
7. Rainer Graefe and others. V. Shukhov (1853–1939). The art of design. – Moscow, Mir, 1994.
8. E. Shukhova, Vladimir Grigor'evich Shukhov. The first engineer of Russia, Moscow, MSTU, 2003.
9. Vladimir Shukhov is an outstanding engineer and scientist. Proceedings of United Scientific Sessions of Science Academy of USSR, Moscow, Science, 1984.