

THE PRODUCTION FEATURES OF LARGE DIAMETER PIPES

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

Pipes with a rectangular cross-section profile

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

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

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

Krah Technology

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

When the profile winding has been completed on the mandrel, the pipe is then transported to the cutting line where the spigot is treated



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

on the outside diameter. This will be done according to the design: for a connection with sealing rings, or for electrofusion welding.

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

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

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

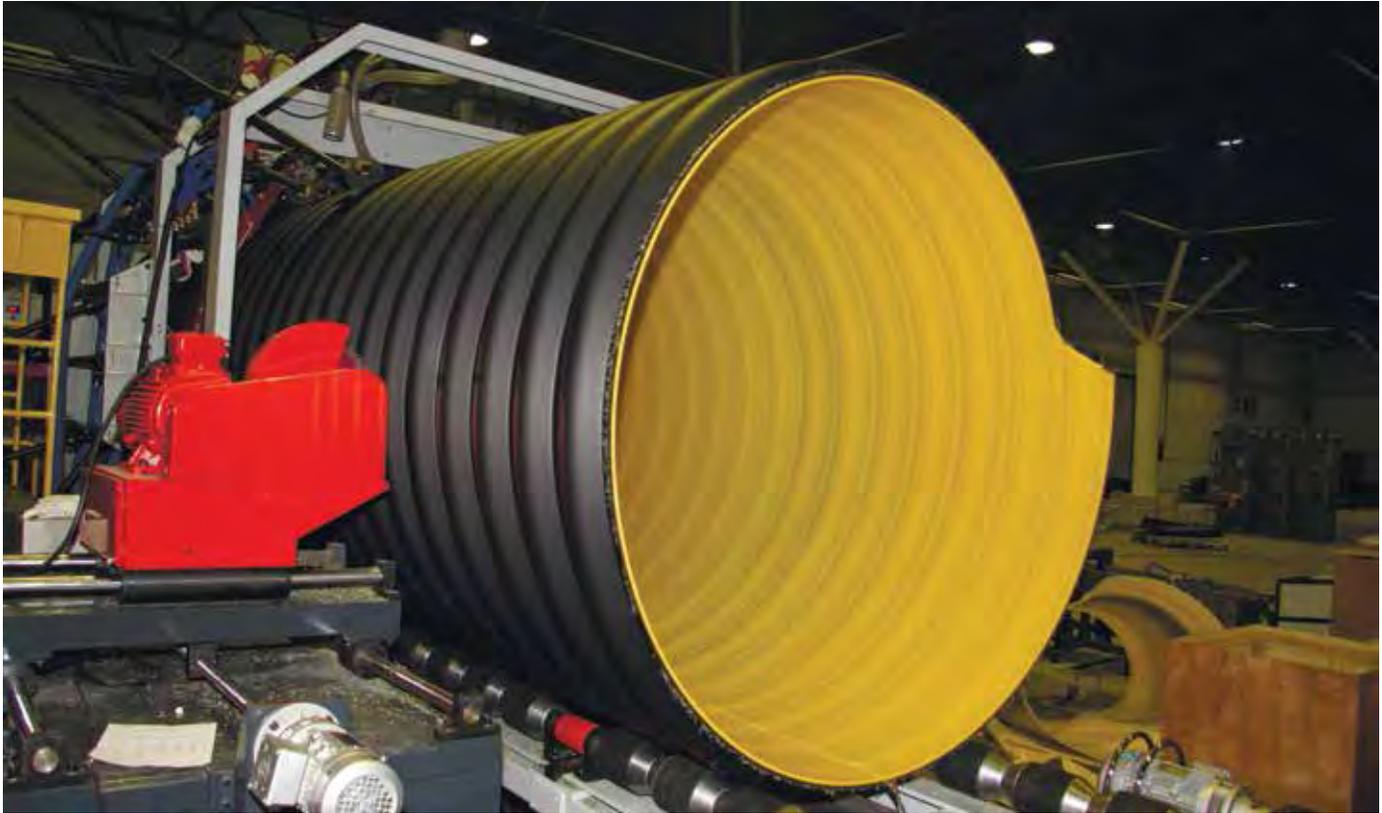


Pic. 3. Pipe wall profiles made using Krah technology



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





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

Metal reinforced pipes with a structured wall

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

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

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

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

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

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

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

