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Concrete Pressure Pipes for Drinking Water – A 15-Year Success for Decast, Canada

■ Mark Küppers, CPI worldwide, Germany

Today, Decast Ltd., in Utopia, Canada, is one of the leading companies on the national infrastructure market. One of Decast's many successful products is the concrete pressure pipe. The manufacture of this innovative drinking water pipe differs from a conventional concrete pipe in terms of both structure and function. It was planned and implemented back in 2003, and in February 2004 the first pressure pipes were delivered to a local construction company. The main supplier of this special production line was the Austrian company Schlüsselbauer Technology, which recently supplemented the line with the addition of a new pre-stressing machine. The company Decast Ltd. was founded in North Bay, Ontario in 1957, where various concrete pre-cast components were manufactured for the local market. The move to the current site in Utopia, approximately 120 km north of Toronto, took place in 1989. 27 years later, the company was renamed Decast Ltd., and Mr. Jim Tully became Executive Vice President.

Over a closed production hall area of 510,000 square feet (47,380 m²), and employing a total of 500 qualified staff, including over 30 engineers and technologists, Decast produces concrete pre-cast components for various fields of application, around the clock. These include products for tunnel construction, such as segments and microtunneling pipe.

With microtunneling pipes, Decast reduces traffic congestion and therefore makes work easier for people. That's because these systems make it possible to avoid excavating open construction trenches along the entirety of the planned pipeline, significantly easing traffic disruption.

Bridge construction is a very important area of operation for Decast. The company produces bridge girders up to 50 m in length, as well as modular bridge systems. The advantages of the very rapid construction progress using concrete pre-cast components are undeniable, which means this construction method is of ever-increasing significance and demand at Decast.



Decast Ltd. company premises in Utopia



Decast external storage areas

What's more, in addition to concrete pre-cast components for waste water and rainwater drainage, Decast also manufactures numerous special prefabricated components, such as supporting walls.

York Peel Project - Green Light for Pressure Pipe Manufacture

In July 2003, the company obtained the order for supplying concrete pressure pipes for the York Peel Project (detailed report in BWI 1/2006). In this project, worth over 100 million Canadian dollars, the job consisted of constructing a mains water pipe which was intended to transport up to 381 million liters of drinking water per day from the Peel district to York. This large-scale project required a total of 24,000 m of pipes, with the majority - a total of 18,500 m - having a diameter of 1,800 mm. The other diameters were 2,100, 1,050, 900 and 750 mm. In addition, over 500 connectors had to be produced.



Since 2003, Decast has also been producing concrete pressure pipes for transporting drinking water

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Concrete pressure pipes are particularly suitable for supplying drinking water as they are very sturdy and durable, and concrete is the ideal material for transporting drinking water. Moreover, the pipes are intrinsically very stable, and have a

very high strength over the entire pipe length. Potential defects that may later arise in the bedding of the pipes therefore represent a significantly lower risk for the concrete pressure pipes than for other types of pipe.



First of all, an endless steel cylinder is produced from sheet steel, from the coil, using spiral seam welders and moulding equipment.



The steel cylinders comprising the welded end rings undergo a hydrostatic leak test.



The end rings are then welded, over the entire periphery of the steel cylinder in order to be coupled and sealed.



Packerhead pipe machine for applying the inner concrete core



Safe and quick product handling using telescopic grabbers

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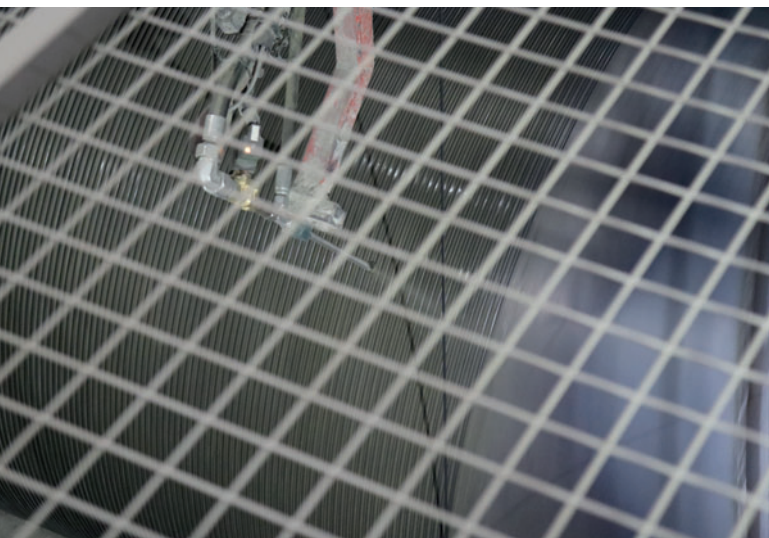
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The high-speed pre-stressing machine from Schlüsselbauer Technology has been integrated into the production line, significantly improving the process.



Continuous spraying on of the cement suspension



The pre-stressing wire is applied over the entire length of the tube.

Schlüsselbauer Supplies the Entire Plant Technology for Pressure Pipe Production

In order to be able to handle this large-scale order, the first step was to create a new production line for these products. Schlüsselbauer Technology proved to be the right partner for this job, and as a result the first automated manufacturing plant for large-diameter pressure pipes in North America was created.

The Austrian experts were also responsible for providing additional machines for the production process. The concrete pressure pipes are produced in four main steps.

Production of the Steel Cylinder

First of all, an endless steel cylinder is produced from sheet steel, from the coil, using spiral seam welders and moulding equipment. To do so, the seams are welded from the outside and the inside, over their entire length. Cylinders of the desired lengths are then constantly cut from this endless cylinder.

An end ring welding machine is then used to provide the cut steel cylinders with end rings at both ends, as the name suggests. The end rings are then welded along the entire periphery of the steel cylinder in order to be coupled and sealed.



The coating plant applies a protective layer of concrete cement to the pre-stressing wire.

In the next step, the steel cylinders comprising the welded end rings undergo a hydrostatic leak test. Not one drop of water may emerge from any of the seams; otherwise, the cylinder would not be suitable for use in pressure pipes, and would definitely not be released for further production. The required immediate 100% tightness was mastered very quickly, and therefore nowadays virtually all the steel cylinders produced pass the leak test.

Casting Moulds or Packerhead pipe Machine for the Concrete Coating

In the next step, Schlüsselbauer handling equipment is used to erect the steel cylinders from the horizontal position and to insert them into a pipe mould of the Besser packerhead pipe machine. The tubular machine then produces the concrete lining of the pressure pipe; essentially a concrete pipe in the steel cylinder. This cylinder is the outer shell skin in pipe manufacture. The result is a two-component pipe comprising an outer steel casing and a concrete core.



Finished pressure pipe in the quality check

The fresh pipes are then stored in the IFS furnace for at least 12 hours, in order to harden, in accordance with provision C301 of the AWWA (American Water Works Association).

Optimized Product Handling

Decast leaves nothing to chance when it comes to product handling. The Schlüsselbauer handling equipment provides a high level of safety for personnel, and also damage-free products.

The handling systems are very important for high productivity, in particular if, as in the case of pressure pipe production, several handling steps are required. Decast is therefore focusing on crane systems with telescopic grabbers. The products therefore do not oscillate, which significantly improves the industrial safety and the speed.

High-Speed Pre-Stressing Machine

Once the concrete core has hardened, the pipe is again turned horizontally, and transferred to the pre-stressing machine recently installed at Decast, which replaced the original pre-stressing machine. The new pre-stressing machine surpasses the old machine with regard to work and process safety, as well as speed.

The pipe rotates at a controlled speed in the pre-stressing machine, while at the same time a pre-stressing wire is tensioned over the entire steel cylinder, at the required strength. While the pre-stressing wire is being applied, a cement suspension is continuously sprayed onto the surface of the cylinder, which is then immediately wound with the pre-stressing wire. This ensures reliable corrosion protection.

When the pre-stressing wire has been applied over the entire pipe length, the pre-stressing wire is clamped in a tension-proof manner in a special clamp, at the pipe end.





In operation for years: Schlüssellbauer Technology Ringmaster

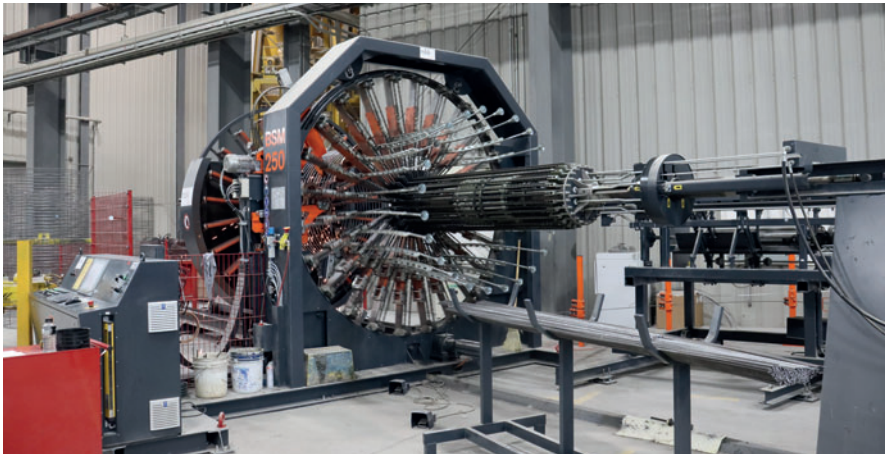


Also successful in continuous operation: Schlüssellbauer Exact pipe and manhole component machine

Coating Plant

In the fourth main step, the pipe, wound with pre-stressing wire, is moved by crane to a concrete coating machine, in which a protective layer of concrete is applied onto the pre-stressing wire. In the concrete coating machine, the pipe is rotated continuously, and Shotcrete is applied, from above, over the entire length.

The finished pipe is subsequently conveyed to a curing chamber for final hardening. Prior to being stored in the extremely large external site, the finished pressure pipes all undergo a further quality check conducted by Decast personnel.



The machinery in the reinforcement hall has recently been supplemented by the BSM 250 cage welding machine

First-Class Quality Assurance: ACPPA Compliance Audit and Certification Program, administered by Lloyd's Register Quality Assurance (LRQA)

Amongst many certifications that Decast has, Decast is a ACPPA (LRQA) certified concrete plant. Plants that have ACPPA (LRQA) certification have achieved the highest level of quality in all aspects of production. This certification offers architects, engineers and other customers a way of easily determining which manufacturers have the best production and processing processes in North America.

Furthermore, Decast is certified by the Professional Engineers Ontario (PEO) and is a member and sponsor of Consulting Engineers Ontario (CEO).

The high cement quality is constantly monitored in the company's modern testing laboratory, and research is continuously conducted internally into the development of the cement mixtures, as well as in the field of self-compacting concrete.

Good Partnership is also Reflected in Other Plants

"The company's mission is to produce goods compliant with the highest global standards. In order to be able to achieve this, you of course need the right equipment", explains Jim Tully. In the case of the monumental task of designing the manufacture of concrete pressure pipes, we found, in Schlüsselbauer, the right partner for achieving this aim.

And this partnership continues to this day. In addition to pressure pipe manufacture, Decast has also been operating additional Schlüsselbauer Technology production plants for many years. Primarily, very large numbers adjustment rings are produced very satisfactorily using a ringmaster manufacturing system. In the immediate vicinity, a Schlüsselbauer Exact pipe and manhole component machine has been in continuous operation for several years.

With regard to the manufacture of reinforcement cages, Decast has put its faith in the machines from the German com-

pany mbk Maschinenbau. A new cage welding machine, BSM 250, has recently been brought into operation. And with that there is now a total of four mbk welding machines in operation at the plant in Utopia.



Watch a video about Decast Ltd. Simply scan the QR code with your smartphone and start the video.



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