Schlüsselbauer Technology GmbH & Co KG, Gaspoltshofen, Austria

Nuovo Acquedotto Marcio – Construction phase I: DN1800 concrete pipes supply Rome's drinking water

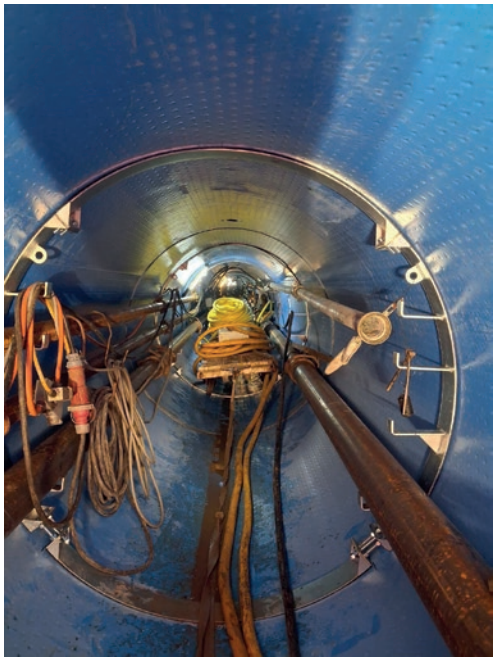
■ Christian Weinberger, Schlüsselbauer Technology GmbH & Co KG, Austria

In recent decades, pipeline construction in most European countries has focused on transport infrastructure or municipal wastewater or surface water drainage. Most drinking water mains were installed during the second half of the 20th century. In the many years that have passed since, work in this area has, at best, largely been limited to repairs, or the renewal of short sections. Now, however, there are some signs that this is changing in and around expanding urban centers. Increasingly, main supply lines are approaching capacity limits due to the dimensions used when they were installed. At the same time, there is a growing need to shore up supply for critical areas using alternative pipeline routes.

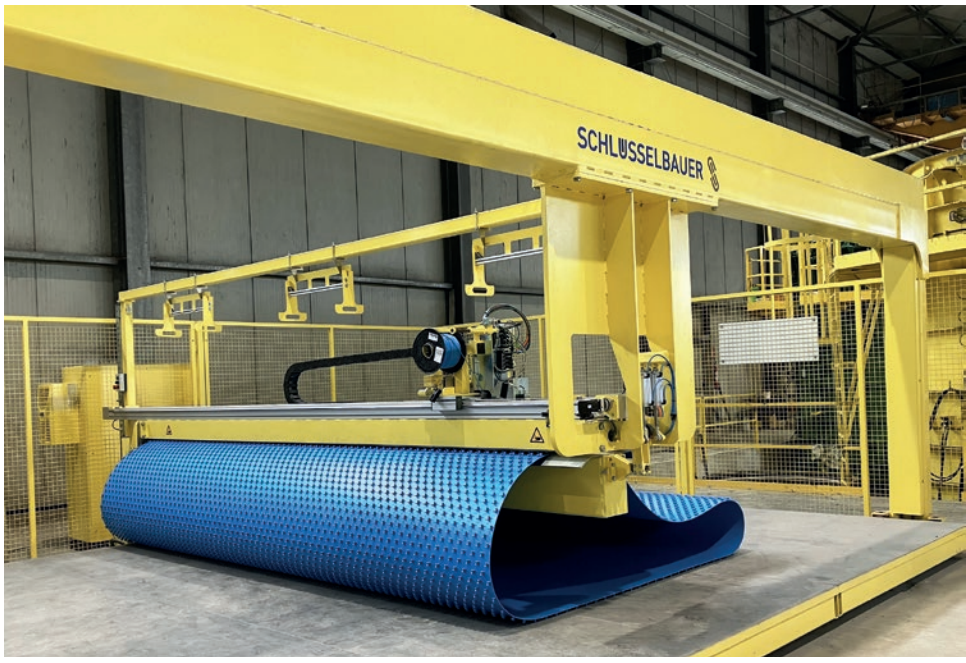
The Acquedotto Marcio is the oldest aqueduct system managed by Acea Ato2. The two existing conduits were constructed between 1860 and 1930 in masonry, working with free hydraulic flow. The aqueduct supplies approximately 25% of Rome's water demand, serving the eastern and south-eastern areas of Rome as well as 16 municipalities managed by Ato2.

The first phase of the project for the construction of the Nuovo Acquedotto Marcio involves the installation of two pipelines with a total length of about 7.5 kilometers (the first section of approximately 2.5 km using two parallel pipelines, and a second section of about 5 km constructed with DN1800 pipes), up to the planned interconnection near the "Sifone Ceraso."

The key element of the project is the installation of a DN1800 reinforced concrete pipeline internally lined with HDPE. Considering the specific characteristics of the area - environ-



Nuovo Acquedotto Marcio



The plant for automatic welding of Ultra-Grip PE concrete protective liners into cylinders–a key step in the production chain at ILCEV

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Schlüsselbauer Technology plant for liner processing and pipe wetcast moulds before final start-up

Inserting the liner cylinder made from Agru concrete protective liners into the 4 m-high pipe wetcast moulds

mental, archaeological, and geo-lithological - the selected technology for installing these pipes is microtunnelling. This choice makes it possible to operate from a limited number of carefully selected points (start and end shafts), thereby significantly reducing open excavation and overcoming geomorphological challenges while enabling linear alignments mainly.

While this solution offers the mentioned advantages, it requires particular care in the design of the elements to be installed. These must ensure maximum reliability, not only in terms of the specified load-bearing and watertight performance during operation, but also in resisting the stresses encountered during installation. In addition, they must guarantee optimal characteristics to avoid - or reduce to a physiological minimum - the need for maintenance over the long service life expected for these works.

For this remarkable project company ICOP, entrusted with carrying out the works, developed the design of the DN1800 pipeline in detail with the support of ILCEV, a long-standing partner in the production of concrete jacking pipes. Two of the specs associated with the tender for the pipeline were the need for a continuous internal lining of the pipes suitable for drinking water, and also the pressure requirements for this pipeline.

For the corrosion-resistant polyethylene interior lining, they opted for the tried-and-tested concrete protective liner range from Agru Kunststofftechnik GmbH, a leading international specialist in high-performance plastic solutions, headquartered in Austria. With decades of experience in challenging infrastructure projects, Agru offers a concrete protective liner range covering a wide variety of applications, including a cer-

Demoulding the outer mould—another pipe is ready for retrieval

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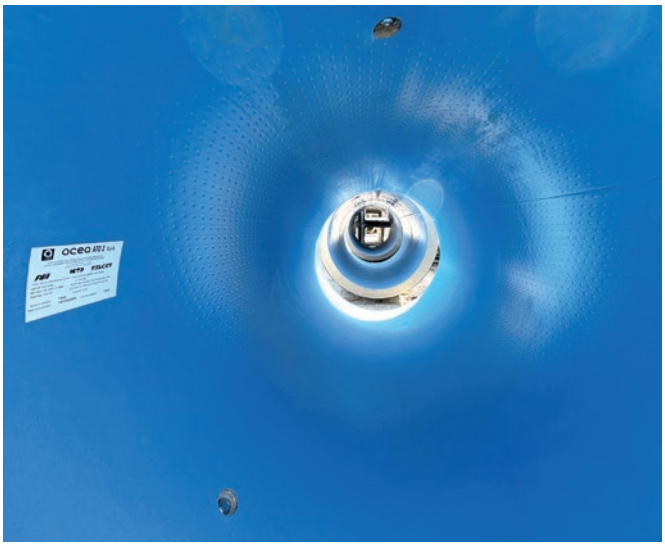
Recently demoulded interjack pipe with partially reduced wall thickness

tified drinking water-approved version. These were not the only notable requirements, however—the pipeline also had to withstand an operating pressure of 6 bar and a test pressure of 9 bar. ICOP worked with ILCEV to develop a suitable pipe design and built a dedicated test rig in close collaboration with Agru to verify the test pressure.

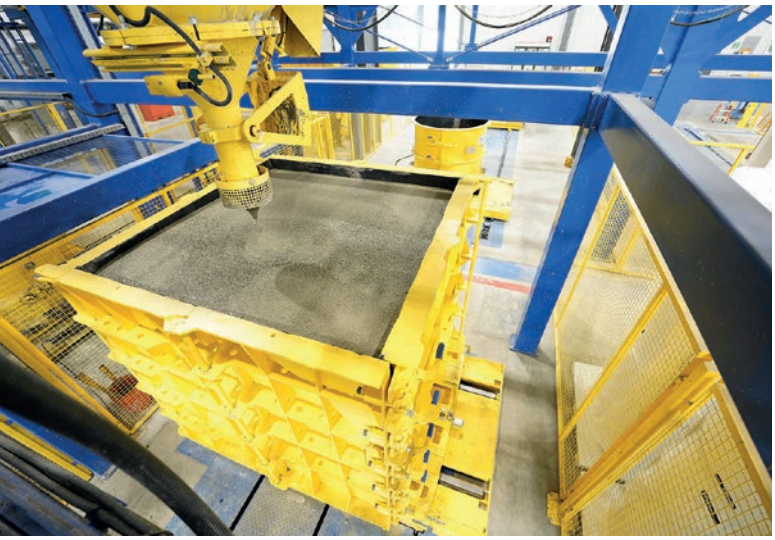
Extensive research conducted by ICOP and ILCEV into the manufacture of liner cylinders, processed in high-performance concrete casting moulds for self-compacting concrete, led them to Schlüsselbauer Technology. While developing a fully corrosion-resistant concrete wastewater pipe for the market, Schlüsselbauer—an Austrian manufacturer of production plants for concrete pipe and manhole elements—devised an automatic welding process for PE cylinders, which also turned out to be ideally suited for this project. The Agru Ultra-Grip concrete protective liner is measured and cut according to the pipe internal diameter and then processed into a cylinder using extrusion welding. The cylinder encloses the steel core of the wetcast mould, while the anchors on the back ensure the liner is firmly secured to the mould-hardened concrete pipes.

Also supplied by Schlüsselbauer Technology, the wetcast moulds for this specific type of concrete pipe (DN1800) with construction lengths of 3, 3.5 and 4 m feature, alongside the steel core, expandable outer moulds and hydraulic preliminary demoulding of the spigot segments. This ensures that accurately moulded sealing chambers are produced undamaged at the jacking pipe spigot in every production cycle. Schlüsselbauer Technology also provided further mould components for the daily production of two products per mould and for manufacturing interjacking pipes. The development of precision-manufactured concrete casting moulds is a cornerstone of Schlüsselbauer Technology's production technology offering. The company provides innovative mould

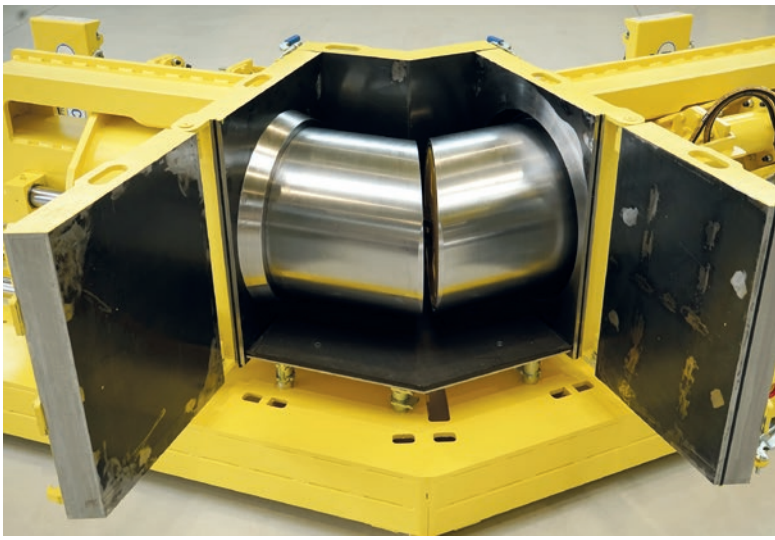
Gentle loading of PE-lined pipes using jacketed forklift tines ILCEV specializes in the manufacture of pipelines for pipe jacking. Since 2024, it has been part of the Gruppo Grigolin, an international group of companies focusing on the construction and engineering industry.



Jacking pipes with bentonite injection ports and detailed labeling ready for transport to the installation site



Perfect Forming Technology–square in this case–designed for processing SCC; all sealing elements are machined to high precision at Schlüsselbauer Technology



Perfect Forming Technology–Bends and inlet components are manufactured in one pour in moulds with retractable steel cores

equipment for a wide range of concrete products, ensuring reliable leak-tightness, extended service life and increased operator comfort.

Perfect Forming Technology

The moulds required for the ICOP/ILCEV project were designed and produced by Schlüsselbauer Technology under the Perfect Forming Technology designation. All moving mould components, such as sealing surfaces, closing mechanisms and recesses for installation parts are precisely machined. Alongside the moulds manufactured for this project, Schlüsselbauer Technology also produces wetcast moulds in a wide range of profile shapes–round, square, oval, custom–and sizes. As well as optimizing the use of each individual mould, Schlüsselbauer also considers their suitability for potential future automation steps at an early stage of the design process. Schlüsselbauer Technology is constantly adding to its range of handling equipment, such as turning grippers for manhole, pipe, and square products.

Perfect Forming Technology–Moulds can be equipped for subsequent automation of production processes from a batch size of one

Perfect Forming Technology—Mould store and curing area in one—Automated high-bay racks are suitable for a wide range of products and moulds and represent an economical solution for concrete plant operations

Automation serves as a basis for reliable processes, ensuring consistently high quality, and optimal use of resources. Schlüsselbauer Technology has decades of international experience in automating concrete part production, whether using the wetcast or drycast method. ICOP's requirements for Schlüsselbauer Technology presented a real contradiction: While the projected daily production throughput for jacking pipe production would inevitably require straightforward single-cycle processes for operating large-scale wetcast moulds, it was also clear from the outset that manufacturing more than 1500 cylinders from Agru concrete protective liners would require a fully automated welding system. The extrusion welding systems developed for Schlüsselbauer's Perfect Pipe concrete-PE hybrid pipes—now established for over ten years—also met ICOP's various requirements once adapted to the specified dimensions.

Cross-Alpine collaboration was key to the success of this project—the international partnership between ICOP and ILCEV on the Italian side and Agru and Schlüsselbauer Technology on the Austrian side, was crucial in ensuring that the pipes required for this once-in-a-century drinking water infrastructure project were delivered to the site on time. ICOP's engineers combined ILCEV's production know-how, agru's expertise in plastics technology and testing methods and Schlüsselbauer Technology's capabilities as a developer and producer of high-quality production plants to great effect. After approximately two years of planning and implementation, including the successful completion of the production phase, those involved from all project partners can now look back with satisfaction on this extraordinary project. ■

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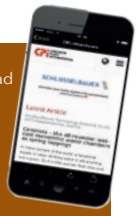

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