

## Case Study: SMS group

# Multi-Wire Submerged Arc Welding of Large-Diameter Pipes

The SMS group has developed into one of the world's leading companies in the field of metallurgical mechanical and plant engineering. As a high-tech company with a global service network, SMS is represented at over 50 locations worldwide and creates pioneering and innovative solutions for its customers through its specialist know-how.

### The challenge

Pipe manufacturers strive for a higher throughput rate in the manufacturing of their products. This can lead to increased error and reject rates. With multi-wire submerged arc welding, an interaction between the welding wires can occur, leading to a disturbed welding process. The aim was to achieve a multi-wire submerged arc welding process for the longitudinal seam welding of large pipes that is both material-friendly and reliable. The reproducibility of the results and the associated competitive production quality are important here as well.

 **SMS group**

**The great advantage of working with Fraunhofer IPK is that we can test complex industrial manufacturing processes and new developments for customers in advance.«**

**Michael Stark,**

Head of Spiral Pipe, Welding and  
Coating Technology at SMS group

## Joint work

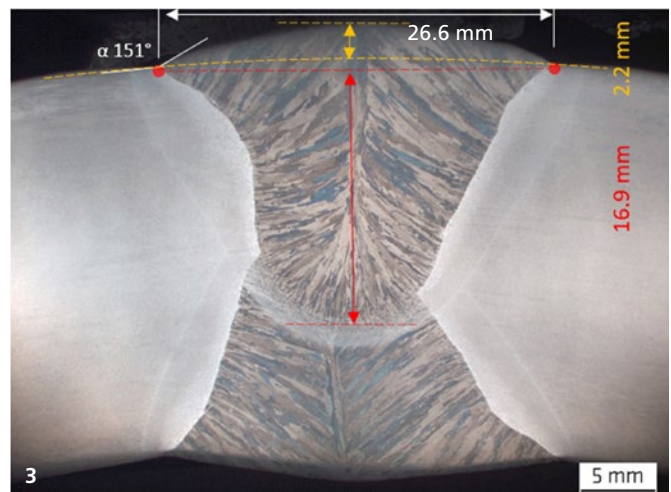
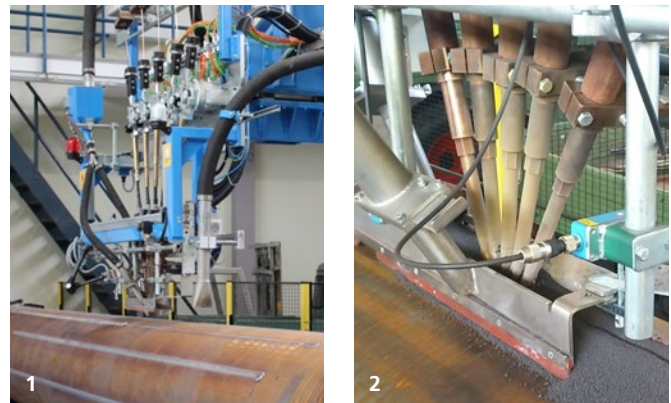
The welding tests were carried out under real conditions, i.e. on six-meter-long pipes and with five welding wires. A full-scale industrial welding system from the manufacturer SMS group GmbH was used for submerged arc welding of longitudinal seams on large-diameter pipes. The resulting advantages are not limited to high deposition rates and welding speeds. With a programmable waveform for current and voltage, it was possible to model the welding result with regard to various factors, e.g. the weld geometry and heat input.

## The solution

The five-wire submerged arc welding process was optimized in terms of welding wire arrangement and edge preparation. As the diameter of the lead welding wire decreases, the penetration depth of the arc and therefore the welding depth increases by approximately 20 percent compared to a conventional welding wire configuration. The weld becomes thinner and has the desired fillet-shaped welding profile. A reduction in the cross section of the weld can translate into increased welding speeds. Less additional material is required and the energy input per unit is reduced. With this configuration, the opening angle can be reduced and it becomes possible to switch to a four-wire submerged arc welding process.

### Further information:

[www.ipk.fraunhofer.de/submerged-arc-welding](http://www.ipk.fraunhofer.de/submerged-arc-welding)



- 1: Test stand for multi-wire submerged arc welding of large-diameter pipes
- 2: 5-wire submerged arc welding head
- 3: 5-wire submerged arc welded seam on a pipe with a wall thickness of 25.4 mm

## Contact us

**Dr. Sergej Gook**  
Research Scientist

Joining and Coating Technology division  
Phone +49 30 39006-375  
[sergej.gook@ipk.fraunhofer.de](mailto:sergej.gook@ipk.fraunhofer.de)

Fraunhofer Institute for Production Systems  
and Design Technology IPK  
Pascalstraße 8–9  
10587 Berlin  
[www.ipk.fraunhofer.de/en.html](http://www.ipk.fraunhofer.de/en.html)

## About Fraunhofer IPK

With the help of application-oriented research, we develop solutions along the entire industrial value circle.

Our guiding idea is a digitally integrated production in which man and machine interact on the basis of data and can thus adapt flexibly and proactively to changing requirements.