



A ROBOTIC SOLUTION FOR A HARSH ENVIRONMENT

The recovery boiler smelt spout area is an unwelcoming and potentially dangerous place to work. However, essential regular tasks need to be carried out in the area for efficient and smooth operation of the boiler. A combined team of ANDRITZ design experts and workshop engineers have come up with a smart solution, the Smelt Spout Cleaning System, that enables essential work and maintenance to take place in a harsh environment.

Smelt can cause several issues in the spout area since it tends to coagulate and plug the openings, which means regular cleaning is essential. In most cases, this operation is carried out manually by the operators with long steel rods to remove solidified smelt. Splashing smelt and a hot environment may sometimes make the spout area a dangerous place to work.

Design and engineering teams from ANDRITZ in Finland merged and used their combined expertise to create a robotic solution that turns a possibly harmful task into an efficient, automated

process. Jocke Jantunen, Product Engineer, Recovery Boilers, ANDRITZ says, "Safety is the number one priority all around the world. Therefore, our main mission is to provide our customers with the finest products that are also the safest to operate and maintain.

"The smelt spout area has always been a potentially dangerous place to work due to the splashing smelt. The smelt spouts are sensitive to plugging and need to be cleaned regularly to prevent hot splashes and small explosions from occurring. In most recovery boilers,

this task is carried out manually, which exposes personnel working in the spout area to possible injuries."

THE SMELT SPOUT CLEANING SYSTEM

After a lot of research and analyzing other products on the market – including other heavy industries where harsh environments are the norm – ANDRITZ teams collaborated and designed a solution that would fit the purpose by utilizing the latest in robotic technology. After a few trials and many experiments, they came up with the Smelt Spout Cleaning

System, an automated, intelligent concept that will clean and maintain up to three ANDRITZ standard spaced smelt spouts using one robotic arm.

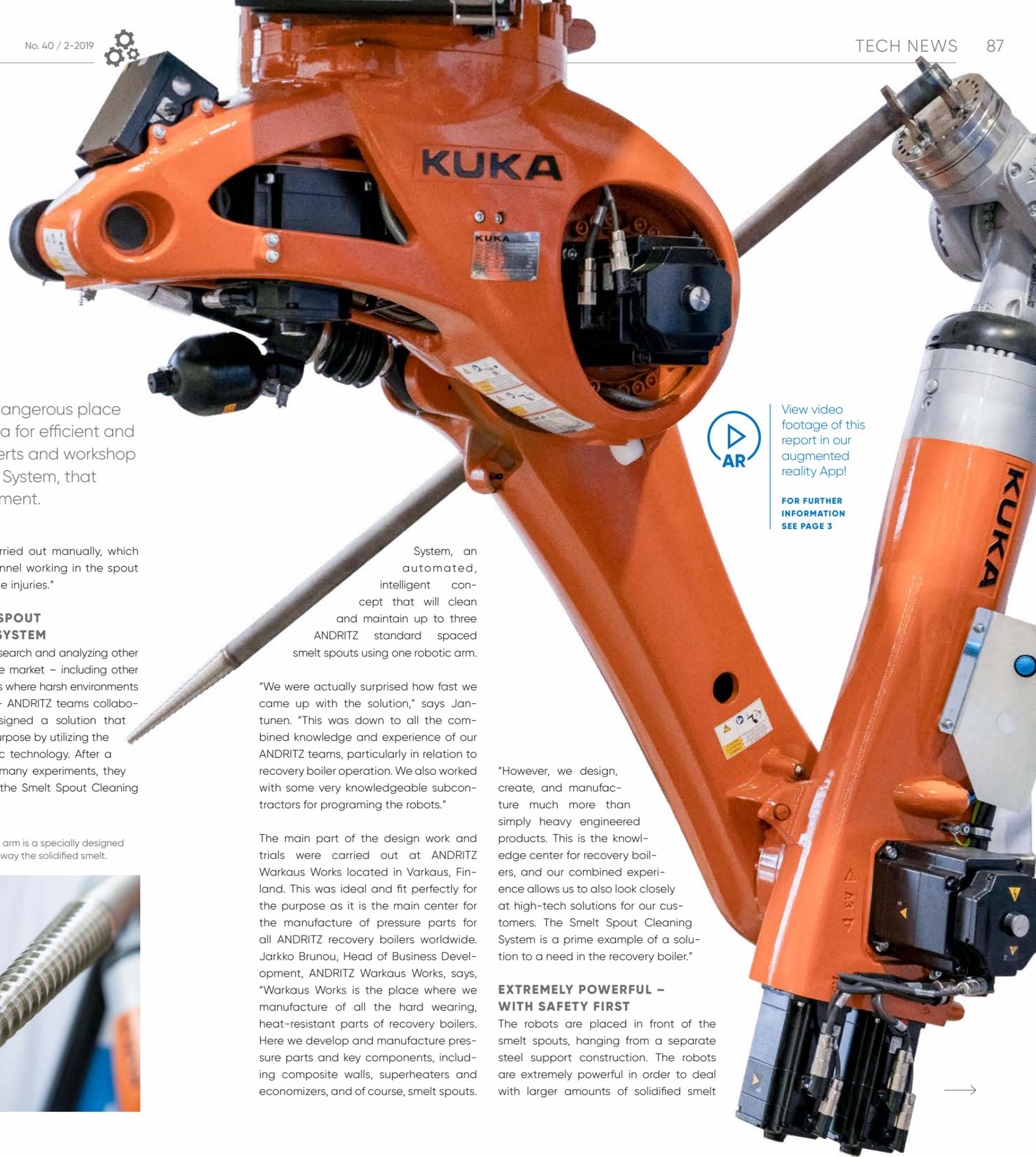
"We were actually surprised how fast we came up with the solution," says Jantunen. "This was down to all the combined knowledge and experience of our ANDRITZ teams, particularly in relation to recovery boiler operation. We also worked with some very knowledgeable subcontractors for programming the robots."

The main part of the design work and trials were carried out at ANDRITZ Warkaus Works located in Varkaus, Finland. This was ideal and fit perfectly for the purpose as it is the main center for the manufacture of pressure parts for all ANDRITZ recovery boilers worldwide. Jarkko Brunou, Head of Business Development, ANDRITZ Warkaus Works, says, "Warkaus Works is the place where we manufacture of all the hard wearing, heat-resistant parts of recovery boilers. Here we develop and manufacture pressure parts and key components, including composite walls, superheaters and economizers, and of course, smelt spouts.

"However, we design, create, and manufacture much more than simply heavy engineered products. This is the knowledge center for recovery boilers, and our combined experience allows us to also look closely at high-tech solutions for our customers. The Smelt Spout Cleaning System is a prime example of a solution to a need in the recovery boiler."

EXTREMELY POWERFUL – WITH SAFETY FIRST

The robots are placed in front of the smelt spouts, hanging from a separate steel support construction. The robots are extremely powerful in order to deal with larger amounts of solidified smelt



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The ANDRITZ Smelt Spout Robot at the testing environment in ANDRITZ Warkaus Works in Varkaus, Finland.

On the end of the arm is a specially designed tool that cleans away the solidified smelt.





and one robot can clean up to three spouts using a long-reach arm. Despite its power, the robot recognizes the position of the spouts through positioning sensors and does not damage them during the cleaning procedure. On the end of the arm is a specially designed tool that cleans away the solidified smelt.

If there are more than three spouts in the recovery boiler, multiple robots can be installed to cover the full range of spouts.

Safety elements have been paramount in the design of the Smelt Spout Cleaning System. The actual working area of the robots is isolated behind a safety fence and the area is locked and clear of personnel when

in operation. Access to the area is by permission only, and when an operator wants to enter the area, robots are automatically driven into a standby mode.

Added safety measures include smelt spout location scanners and cameras for remotely monitoring robot operation. These measures reduce the need to physically inspect the robot working area.

In terms of controls, the system has a local PLC, which handles communication between the DCS and PLC as well as between the PLC and the robotic system. The robot itself can be operated via a touch panel located outside of the safety fence.

The robot control unit contains pre-programmed cleaning sequences and during normal operation the system runs automatically based on cleanliness of the spouts or on a preset timer. If at any time there is a need for the operator to access the working area, a dedicated button can be pressed that will end the current cleaning sequence and drive the robot into a standby position.

The tools at the end of the robotic arm are tailor-made depending on particular smelt behavior. Tool wear is monitored remotely and tool replacement is made easier by the robot automatically moving to the service position, away from smelt splashes. The tool has been designed to be easily changed.

Maintenance of the robots has been designed with safety and simplicity in mind. The smelt spout robot area is equipped with several well-placed hoisting points to allow easy access for maintenance. Normal and scheduled maintenance is carried out on site and can easily be carried out by mill personnel.

BRINGING A ROBOT TO LIFE

The ANDRITZ teams working on the Smelt Spout Cleaning System have built a dedicated, automatic solution to a common problem in recovery boilers – the one of keeping people safe at the same as time carrying out essential



JOKKE JANTUNEN
Recovery and Power,
Product Engineer,
Recovery Boilers,
ANDRITZ

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tasks to ensure maximum efficiency. The robots themselves are supplied by the German company KUKA Robotics, but it's the bespoke design, tailor-made components, and actions for recovery boilers that have brought to life the Smelt Spout Cleaning System.

Jantunen says, “There has been a lot of knowledge, experience, and hard work applied to bringing the Smelt Spout Cleaning System to the market. We have

implemented many features that are specifically designed for operation in the smelt spouts of recovery boilers, and we are really pleased with the results we are getting.

Stora Enso Varkaus, one of the company's flagship integrated board mills is located in the same town as ANDRITZ Warkaus Works and the management at the mill has been very keen to try out the new robotic concept. ANDRITZ installed one of its first smelt spout cleaning robots in

the recovery boiler at the mill where it has received a warm welcome, especially from the operators.

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