On-Load Boiler Cleaning with Water

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FPK II – Combustion Chemistry II
Åbo Akademi University, Åbo
Water cleaning systems

Water Cannon (SMART CANNON):
• Large boilers > 4 m cross section
• Selective cleaning of heating surfaces

Shower Cleaning System (SMART SCS):
• „Slim“ boilers < 4 m cross section
• Cleaning of platen-type heaters
• Areas without any access from side walls

Sootblower operated with water:
• Superheater areas
• Boilers with severe deposition

Combinations hereof
Cleaning Medium Water

Water penetrates into the porous deposits

Water droplets evaporate due to excellent heat transfer

Sudden expansion

Deposits break off
SMART Cannon
SMART Cannon

- Concentrated water jet crosses furnace or empty passes
- Cleaning of opposite wall by means of predefined cleaning patterns
- Nozzle size, water pressure and amount are case specific
The System SMART CANNON™
Incineration of municipal/industrial waste

- Reduced heat transfer in the radiation passes
- High fluegas temperature in front of first superheater
- Heat transfer is shifted to the convectional part of the boiler
WtE Installation – Top View of Boiler

1. pass
2. pass
3. pass

WLB
WLB
WLB
WtE Installation– The Cleaning Effect

View into 2nd pass
Installation Areas – Shower Cleaning (SCS)

Efficient Cleaning of:
- Boiler roof
- Membrane walls
- Platen heating surfaces

Flanges / Guiding tubes

Spray pattern

Exp.: Spray pattern

Flange with half opened valve
Shower Cleaning System (SMART SCS)

SMART SCS
Höhere Anlagenverfügbarkeit bei der Verbrennung von Abfall, Biomasse und Ersatzbrennstoffen

SMART SCS
Increased availability for waste, biomass and RDF fuelled boiler
SMART SCS

System construction

- Water connection and swivel joint
- Inlet pipework
- Outlet pipework
- Stacking system
- Cleaning hose
- Hose cage holder
- Hose cage
- Closing device
SMART SCS Nozzle Designs

Cleaning principle

Umbrella nozzle

Jet Nozzle
SMART SCS – The Product Family

- Fully automated system
- Modular design concept
- Boiler specific solution
- Easy to install
- Based on experienced standard solutions
- High level of development

SMART SCS - SA
Compact and efficient solution for empty paths with small, constant cross sections

SMART SCS - SR
Solution for aligned and in one row guide tubes for big rectangular cross sections and platen heating surfaces

SMART SCS - MR
Extended solution for several guide tube rows over the entire boiler roof
Shower Cleaning System (SCS)

- Waste incinerators
- Biomass boilers
- Refuse Derived Fuels (RDF) boilers
Max. boiler load is limited to **90%** of design boiler load because of fluegas temperature in front of superheater (670°C)

**WtE Installation – Temperature Reduction**
SMART Helix Water

- Waste incinerators
- Biomass boilers
- Refuse Derived Fuels (RDF) boilers
## Deposit severity

<table>
<thead>
<tr>
<th>Deposit hardness</th>
<th>Moderate</th>
<th>High</th>
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- Deposit hardness moderate
- Deposit hardness high
SMART Helix Water Superheater Cleaning with Water

Lanzenabschraubbläser

A Wasser Einlauf
B Wasser Ablauf
C Spezielle Lanzenrohr-Konstruktion gewährleistet Wasserkreislauf
D Düsenkopf mit druckaktiviertem Ventil

Instrumentenmodul Pumpe
E Druckminderer
F Absperrventil

Instrumentenmodul Wassereintritt

Instrumentenmodul Wasseraustritt

Zentrale Wasserversorgung

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SMART Helix Water

- Cleaning modes:
  - „Go-Stop-Clean-Go“ mode

- Flexibility in adjustment of cleaning parameters:
  - axial and rotational speeds
  - blowing angle
  - cleaning intensity
  - oscillating mode
SMART Helix Water Superheater Cleaning with Water
SMART Helix Water
Superheater Cleaning with Water
Example Lignite fired Boiler

Fuel:
- Lignite
- Fluidised bed

- Cleaning frequency based on heat transfer efficiency
- Use of SMART Helix Water up to 5 times a day to increase heat transfer
Example Lignite fired Boiler

- Cleaning efficiency

Before

After