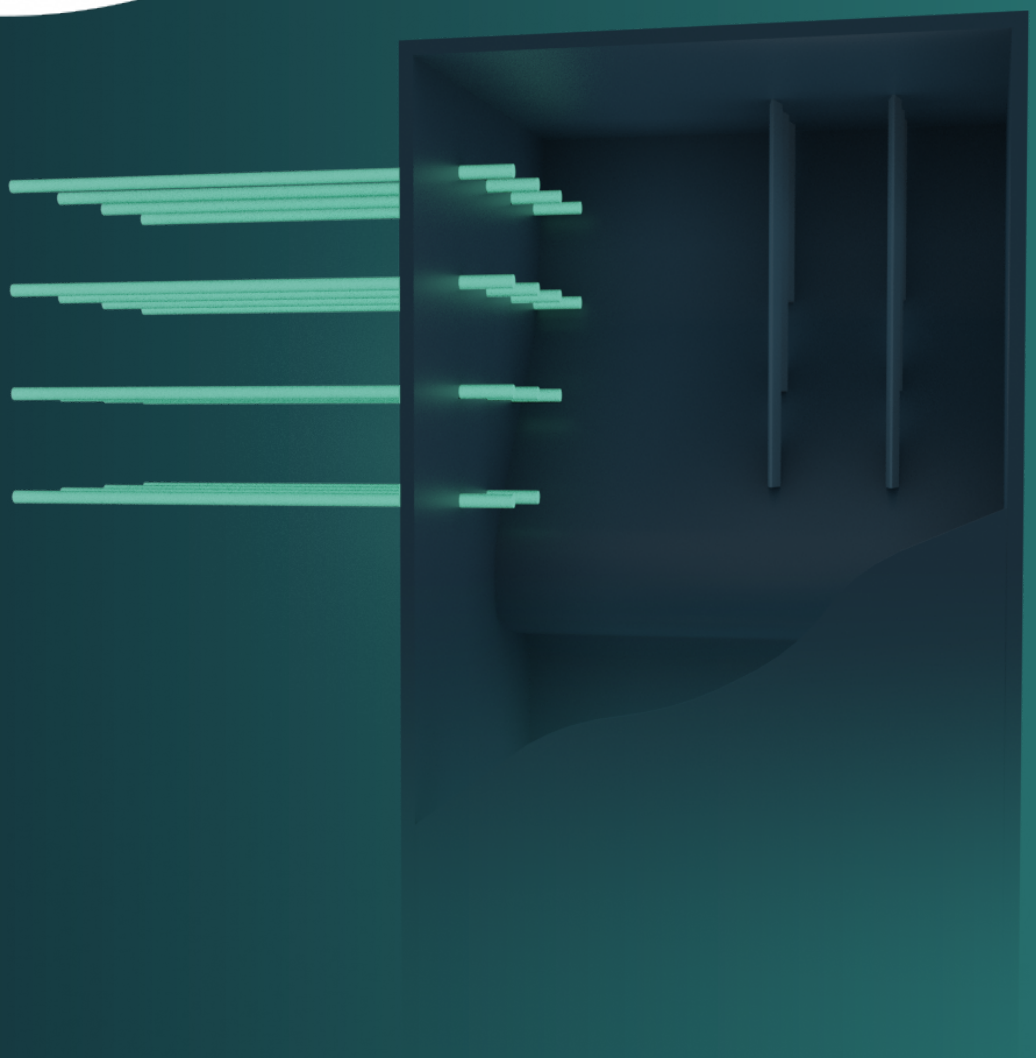


Heat Management

HISS for power boilers

High Impact Sootblowing System™ - Sootblow more with less steam

SOOTBLOWING ISSUES

Sootblowers in power boilers are operated to keep the flue gas path clean and prevent the fouling and sintering of accumulations on heat exchanger surfaces. An issue with conventional sootblowing is that over 90% of the cleaning effect occurs at the first impact of the steam at the heat exchanger surfaces, which means that the time and steam used on the return stroke mostly go to waste.

HIGH IMPACT SOOTBLOWING SYSTEM

Heat Management's patented High Impact Sootblowing System (HISS™) is a tailored solution for your boiler, which will bring great environmental and economical benefits. The solution includes a software and hardware update together with process follow-up and optimization by sootblowing experts. The HISS™ solution can generate the following results:

- Cleaner heat exchanger surfaces, resulting in high steam temperatures and steam production.
- Increased and stabilized boiler efficiency.
- One-way sootblowing: reduces time and steam consumption by 45-50% for one sootblowing cycle. This enables disturbance-free sootblowing-pressure.
- Possiblity to burn cheaper fuels.
- Reduced wear on boiler tubes and equipment.
- Prevented unplanned outages for manual cleaning.

Figure 1 shows how HISS™ can be operated at different settings, the customer can customize the number of starts anywhere between 1-3 after the HISS™ installation.

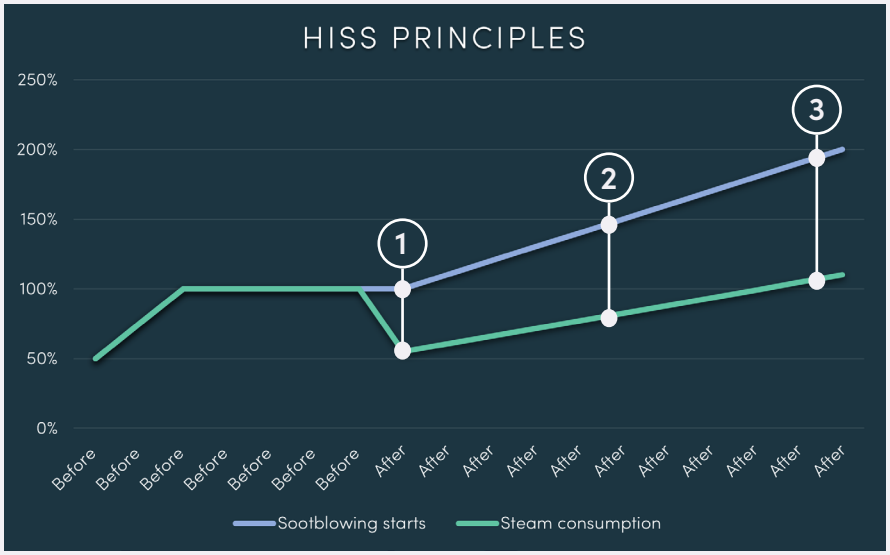


Figure 1. HISS™ system at 3 different settings

1: Steam saving mode: Operate the sootblowers as today but save 30-45% steam, reducing sootblower cycle time by ~50% to generate more electricity

2: Combination: Sootblow more with less steam (can be anywhere between 1-3).

3: Prevent unplanned outages or improve heat transver: 200% sootblowing in problematic areas.

HOW DOES IT WORK?

Heat Management's HISS™ can reduce the time it takes for one sootblowing cycle by 50%. During boiler shutdown, the HISS™ system is fully integrated into the plant's DCS system together with a hardware rebuild of the steam sootblowers, which will achieve overlapping operation of sootblowers (described on page 3). Heat Management's experts will assist the mill in getting the ideal number sootblower starts to fulfill the needs of each customer (see Figure 1).

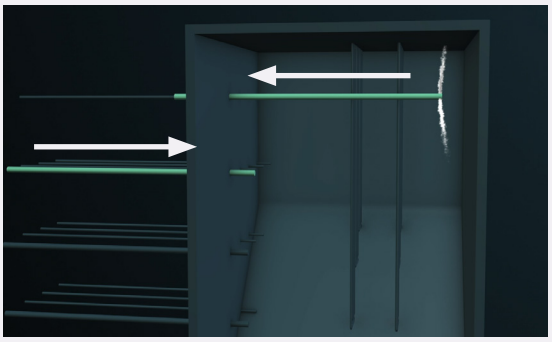
OVERLAPPING SOOTBLOWING

The fact that over 90% of the sootblowing occurs at the first impact of the steam at the heat exchanger surfaces proves that traditional sootblowing is inefficient. Heat Management's HISS™ takes advantage of this and shuts off the steamflow on the entry stroke, to only have steamflow on the retracting stroke. The solution also enables the next sootblower to start when the previous starts to retract, which is called "Overlapping sootblowing", which enables a 50% shorter sootblowing cycle with a 45% reduced steam consumption.

The system is tailored to each customer and the plant can adjust the number of sootblowing starts according needs and preferences. An increased number of starts will enable the plant to burn cheaper fuels while maintaining a clean boiler throughout the season. Heat Management's experts will assist the mill in the optimization of the sootblowing system to maximise the benefits.

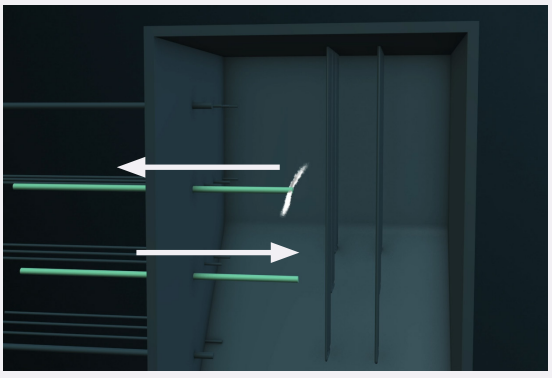
Sequence 1

Sequence 1: *The first lance enters the boiler.* Instead of having full steam flow, HISS™ adds a cooling flow at the entry stroke: steam heats the lance while condensate is purged at low pressure.



Sequence 2

Sequence 2: *Full steam flow and pressure on the first lance as it retracts, and the next sootblower starts to enter the boiler with a cooling flow.* No condensate formation in the lance - less wear on heating surfaces and nozzles, and twice as fast



Sequence 3

Sequence 3: *The sequence continues.* Individual control of steam flow and motor drive: disturbance -free sootblowing pressure, by synched steam flows.

HISS™ PROCESS FOLLOW-UP

The solution does not only include a hardware and software update, it also includes process follow-up and optimization. Heat Management's experts will keep a constant dialogue with the customer and will analyze operational data after the commissioning to maximize the benefits of the system. The process follow-up includes the determination of the optimal sootblowing capacity to fit the needs of the customer.

REFERENCES

In the table below, you can see some of Heat Management's HISS™ references for power boilers. For some of these references, commissioning will take place 2021 and we can guarantee 45% steam saving on sootblowing, increased boiler efficiency, availability and lifetime. Heat Management's experts will tailor the solution and make sure that every customer can maximise the benefits of the system.

Location, startup	Boiler maker	MWth	Number of sootblowers	Fuel	Results
Austrian mill (2021)	Waagner-Biro	150	13	Red liquor	Commissioning 2021, guaranteed **45% steam saving**. Elimination of condensate.
Swedish plant (2021)	Valmet (Generator)	60	5	Waste	Commissioning 2021, guaranteed **45% steam saving**. Elimination of condensate.
Swedish plant (2021)	Valmet (Generator)	60	5	Waste	Commissioning 2021, guaranteed **45% steam saving**. Elimination of condensate.
German plant (2020)	AE&E	100	4	Waste	Guaranteed **45% steam saving**. Elimination of condensate.
Swedish plant (2013)	Babcock & Wilcox, Volund	110	10	Recycled waste wood	Guaranteed **45% steam saving**. Elimination of condensate.
Swedish plant (2013)	Burmeister & Wain	75	5	Waste	The whole boiler was kept clean after the installation. Sootblowers can be operated twice as often when the fuel is difficult, without using more steam.
Swedish plant (2012)	Valmet	70	19	Recycled waste wood	Reduced **sootblowing cycle time by 60%,** which saves 3MWh per day. **45% reduced steam consumption.**
Swedish plant (2012)	Metso	58	16	Biofuel	Increased heat (**+12 MWh/day**) and electricity production (**+7 MWh/day**). Reduced sootblower wear by **50%**. Reduced time for sootblowing at low load by **40%**.

DATA TRENDS BEFORE/AFTER HISS

In Figure 2 and 3, you can see operational data trends provided by one of our customers, displaying how the sootblowing system behaves after installing HISS™. The diagram in Figure 2 shows data measured before the HISS™ installation and Figure 3 is a post-installation graph. The line coloring is described below:

- *Main steam flow rate (kg/s)*
- *Pressure regulation, steam to sootblowers (bar)*
- *Flow, steam to sootblowing system (kg/s)*

The comparison shows that HISS™ stabilized the main steam flow rate and steam pressure (Blue and yellow lines), "pressure hammers" shown in Figure 2 are drastically reduced due to HISS™ Overlapping which results in a reduced wear on the sootblowers, extended life expectancy of the system, and reduced steam consumption, among many other benefits.

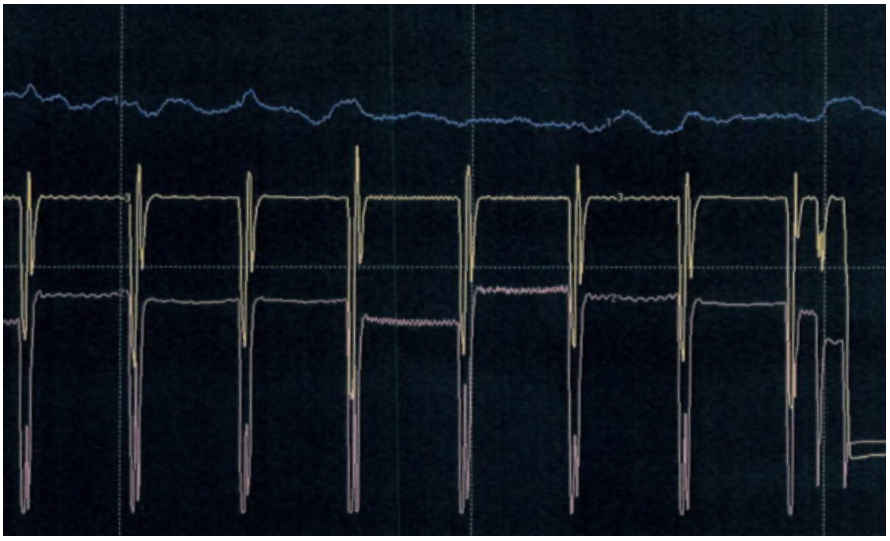


Figure 2. Data trends before installing HISS™

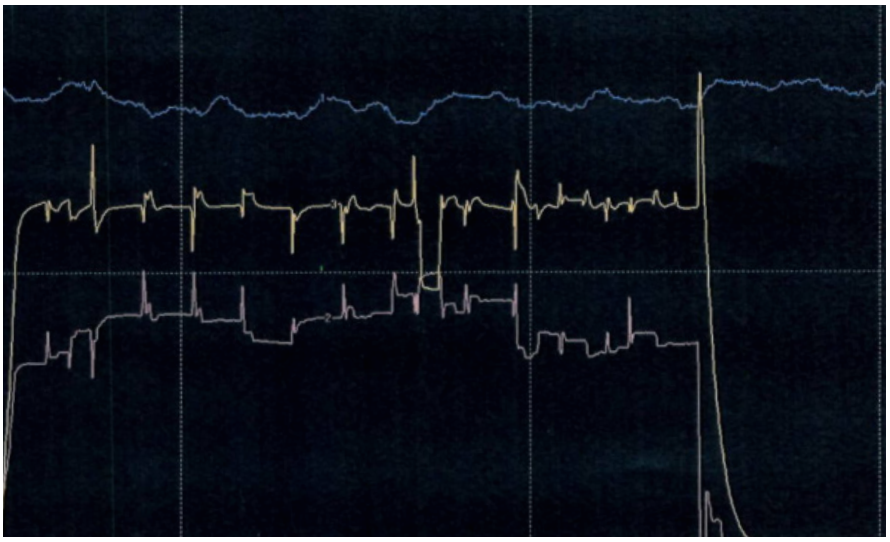


Figure 3. Data trends after installing HISS™

Heat Management

Heat Management was founded in 2016 following a merger between Infrafone AB and Soottech AB. The purpose of the merger was to create a world-leading cleantech company with a superior product portfolio in energy conversion adapted for industrial boilers and incinerators.

Heat Management's customers are found in power and heating plants, pulp and paper mills, cruise- and shipping industry, cement plants, refineries and carbon capture applications. Today, Heat Management supports our 500+ customers with unique, patented solutions in a large number of applications around the world.

qValify ISO 9001 qValify ISO 14001 qValify ISO 45001

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