

# THE MOST ENERGY EFFICIENT CLEANING FOR VARIOUS INDUSTRIES

## COST-SAVING NIRAFON ACOUSTIC CLEANING SYSTEMS



### NIRAFON ACOUSTIC CLEANING IN POWER PLANT APPLICATIONS

Nirafon acoustic cleaning system removes ash particles from heat transfer surfaces and filters by an acoustic pressure shock continuously keeping the boiler clean and working at high efficiency.

#### Heat exchangers (flue gas side)

- Superheater
- Evaporators
- Economizers
- Air preheaters / rotary air preheaters

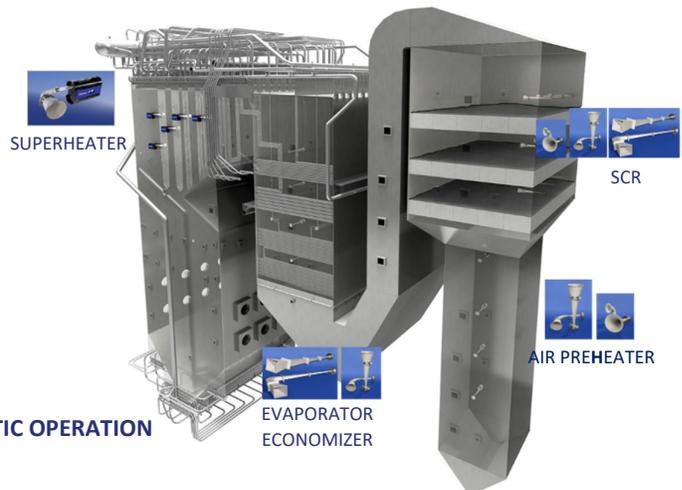
#### Ducts and Channels

#### Cyclones

#### Bag Filters

#### Electrostatic Precipitators

#### Fans



### CONTINUOUS CLEANING DURING THE PROCESS, AUTOMATIC OPERATION

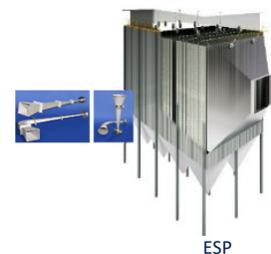
- Maintains plant efficiency at a high level
- Cleaning without interrupting plant process/production
- Cleans also, the shadow areas
- minimize requirement of manual cleaning and downtime
- These all lead to reduced emissions

### CLEANING WITHOUT DAMAGING

- No erosion
- No mechanical wear
- No corrosion

### ECONOMICAL SOLUTION

- Lower initial capital investment
- Low operating costs
- Low maintenance costs
- Reduces the need of water at the plant
- Lesser space requirement
- The Nirafon® system can be used in combination with existing cleaning system



Pneumatic Acoustic Cleaners Nirafon®

# NI250, NI100 and NI60

Cost Effective Acoustic Cleaning System

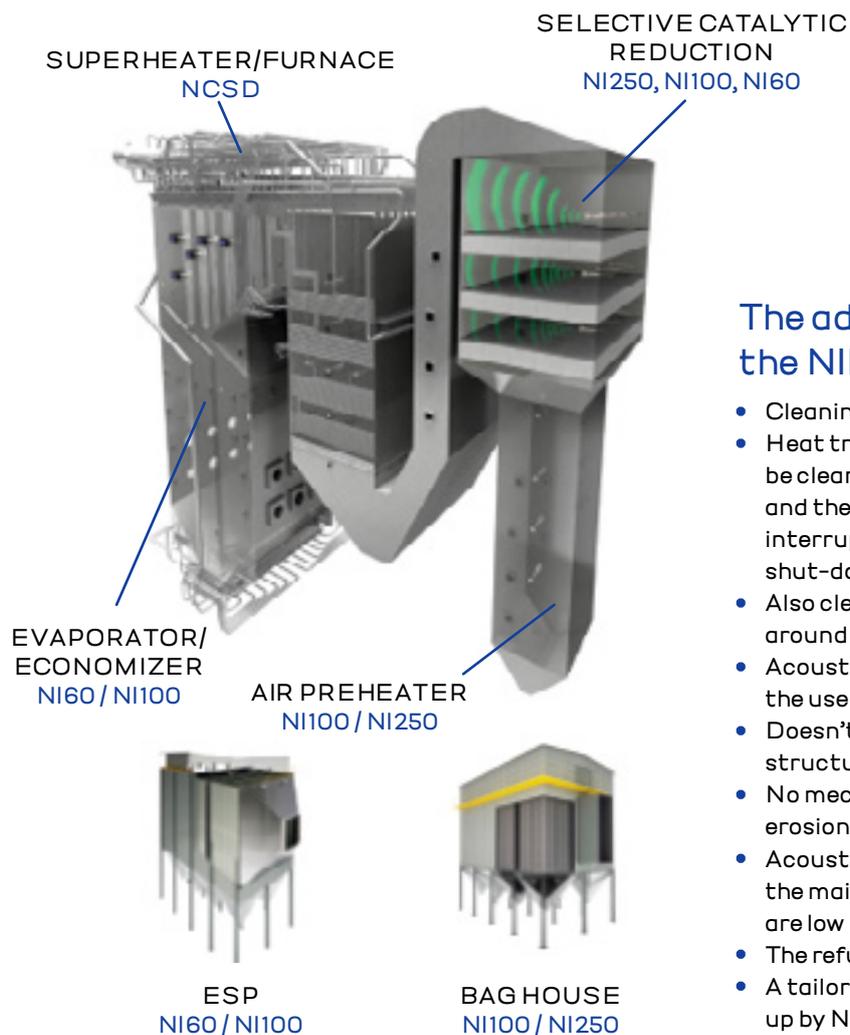


By means of NIRAFON acoustic cleaning, particles in dry form, such as cinder and soot, cement, powder and flour, can be removed from places where they are not desired. Sound travels conically in space and is reflected from the surfaces; consequently, the Nirafon acoustic cleaning system is also effective in fringe areas and around corners.

Usage targets are plants in energy and process industries, i.e. heat transfer surfaces: superheaters, evaporators, economizers and air preheaters, cyclones, ducts, filters and fans. Acoustic cleaning can also

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## Cost saving acoustic cleaners



### The advantages of the NIRA FON® system:

- Cleaning during process
- Heat transfer and other surfaces to be cleaned stay permanently clean and the process can continue without interruptions, rendering expensive shut-downs unnecessary.
- Also cleans the shadow areas and around the corners
- Acoustic cleaning drastically reduces the use of water at the plant
- Doesn't cause any harm to structures
- No mechanical wear, no corrosion or erosion
- Acoustic cleaners require little space, the maintenance and operating costs are low
- The refund time of the system is short
- A tailor-made plan is always drawn up by Nirafon Oy according to the buyer's need and application

### Technical data



	NI250 & NI250-90	NI100 & NI100-90	NI60 & NI60-90
Basic frequency	250 Hz	100 Hz	60 Hz
Sound pressure level	150 dB	150 dB	150 dB
Materials	EN 1.4401 / 1.4404 (AISI 316 / 316L)	EN 1.4401 / 1.4404 (AISI 316 / 316L)	EN 1.4401 / 1.4404 (AISI 316 / 316L)
Compressed Air:			
Compressed air pressure	>6 bar	>6 bar	6 bar
Flow	50 Ndm <sup>3</sup> /s	50 Ndm <sup>3</sup> /s	50 Ndm <sup>3</sup> /s
Consumption	2-20 Nm <sup>3</sup> /h	2-20 Nm <sup>3</sup> /h	2-20 Nm <sup>3</sup> /h
Operation temperature (flue gas temperature)	up to 800°C	up to 1000°C	up to 1000°C

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# NCSD®

Specially designed for cleaning of high temperature areas, up to 1500°C flue gas temperatures



Specially designed for cleaning of high temperature areas, up to 1500°C flue gas temperatures Nirafon Cleaning Sound Device is an innovation for cleaning of the high temperature areas of boiler plants. The method enables the acoustic cleaning of both the combustion chamber and the superheater area without stopping the process. The NCSD® cleaner is the achievement of the product development carried out at Nirafon® Oy. The device produces a very high, over 170 dB, sound pressure pulse, which makes it very effective. In addition to this the device is very reliable in use. This third generation acoustic cleaner keeps the heat transfer surfaces clean even at spots where ashes are present partly in both molten and solid forms.

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### NCSD® Operating Principle

The cleaning effect of the NCSD® is obtained by quickly burning a small amount of flammable gas in the combustion chamber of the device, producing quick sound pressure pulses and leading the pulses through a horn into the space to be cleaned. LP or Natural gas is used to fuel the device, obtainable e.g. out of the LP gas network for the ignition burner and the air for burning is obtained from normal compressed air.

The NCSD® cleaner produces 4 to 10 cleaning pulses per second while running. During the cleaning cycle the NCSD® is typically ran for a few seconds with a few minutes' interval. The particles adhering to the surfaces stick to each other as well as surfaces of the structures. The change in the speed of the gas flow caused by the NCSD®

detaches the particles from the surface. Once the particles have been detached by the pulses of the NCSD® they either fall down by the gravity or flow away with the stream of flue gases. When the cleaning cycle is repeated often enough, the surface stays clean.

### The advantages of the Nirafon® system:

The NCSD® enables acoustic cleaning of the entire boiler plant. When the NCSD® cleaner is used at higher temperatures and with more challenging deposits and traditional pneumatic Nirafon® acoustic cleaning in areas of lower temperatures, the advantages of acoustic cleaning are achieved in the entire plant:

- Cleaning during process
- Heat transfer and other surfaces to be cleaned stay permanently clean and the process can continue without interruptions, rendering expensive shut-downs unnecessary.
- Also cleans the shadow areas and around the corners
- Acoustic cleaning drastically reduces the use of water at the plant
- Doesn't cause any harm to structures
- No mechanical wear, no corrosion or erosion
- Acoustic cleaners require little space, the maintenance and operating costs are low
- The refund time of the system is short
- A tailor-made plan is always drawn up by Nirafon® Oy according to the buyer's need and application



### Technical data

	NCSD®
Operation Frequency	4-10/s
Sound pressure (C)	over 170 dB
<b>Material</b>	
Actuator	AISI316/Fe52
Horn	AISI316/SS2343/G-X15-CrNiSi229
Compressed air consumption	c. 50 Ndm <sup>3</sup> /s during operation
Gas consumption	c. 0.4g/pulse, 4g/s
Operation temperature (flue gas temperature)	up to 1500°C