PIC
PRECISION ICEBLAST CORP

HRSG DEEP CLEANING ™

Thermal Insulation

Case Study

PRECISION ICEBLAST CORP

CASE STUDY

Italy Project | 2023

OVERVIEW

Precision Iceblast, a company specializing in industrial cleaning services, was hired to perform cleaning maintenance on two HRSG (Heat Recovery Steam Generator) units that were contaminated with thermal insulation. This contamination led to a range of issues, including thermal performance loss, increased backpressure for the gas turbine, decreased combined cycle plant reliability, and reduced power generation.

The scope of the cleaning work involved cleaning 4 (four) tube modules in each HRSG unit, totaling 6 (six) faces in each. Precision Iceblast utilized its proprietary procedure, **HRSG Deep Cleaning™,** to address these challenges. The process required accessing each face to apply the deep cleaning.

Over a period of twenty-nine days, the Precision Iceblast team worked in two shifts of twenty-four hours each to complete the cleaning of the two HRSG units. Upon completion, a detailed cleaning report was provided for each HRSG.

While the customer provided scaffolding and fuel for the compressor, Precision Iceblast provided all necessary equipment, including specialized blasting tools, ultra-high-pressure compressors, dry ice, and trained personnel for the job.

This experience offers a detailed insight into how Precision Iceblast tackled and resolved the challenges posed by the contamination of the HRSG units, demonstrating their expertise and ability to provide effective solutions to complex issues in the energy industry.

ANSALDO ENERGIA

Manufacturer: ***Ansaldo***
Design: ***Horizontal flue gas***
Year of manufacture: ***2002***

BENEFITS

POWER OUTPUT RESTORATION

+ 37.5 MW

ANNUAL SAVING

$25.5 million

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WORK SCOPE

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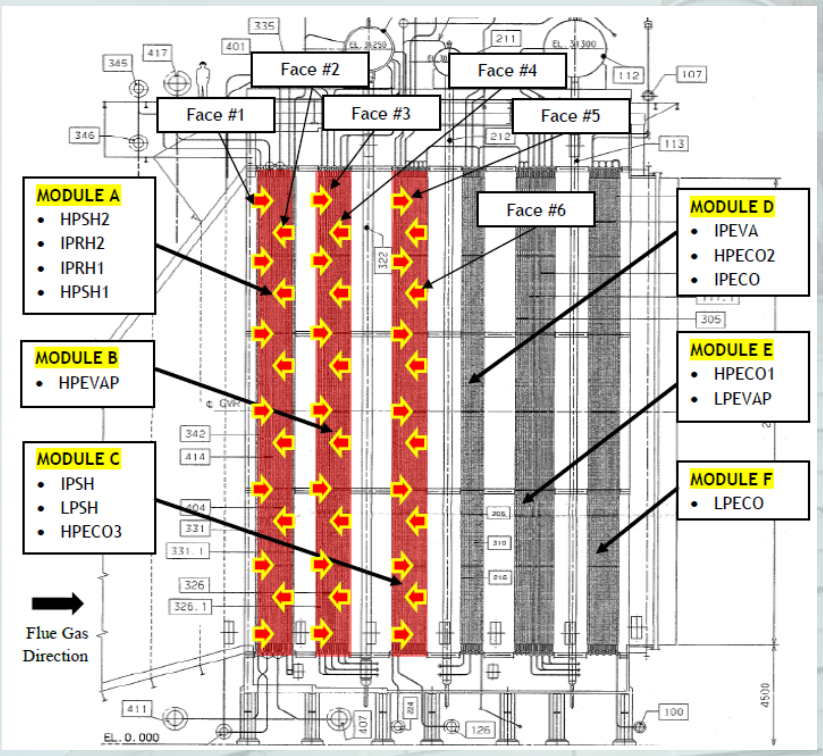
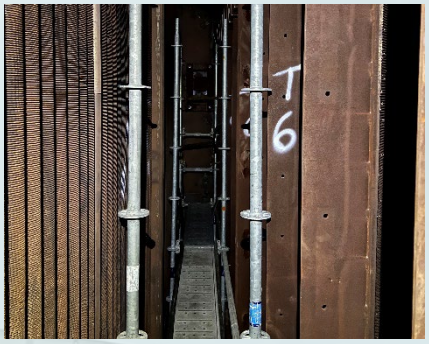
MODULES WHERE THE HRSG DEEP CLEANING ™ PROCEDURE WAS APPLIED



Height: 21 mt; 68 ft / Width: 7 mt; 22 ft



Scaffolding System

WORK SCHEDULE

MODULE	A		B		C		
FACE	UP	DOW	UP	DOW	UP	DOW	BLOWDOWN
# SHIFT	2	2	8	8	2	2	2
DEEP CLEANING	Every 2 Lines		Line by Line		Every 2 Lines		

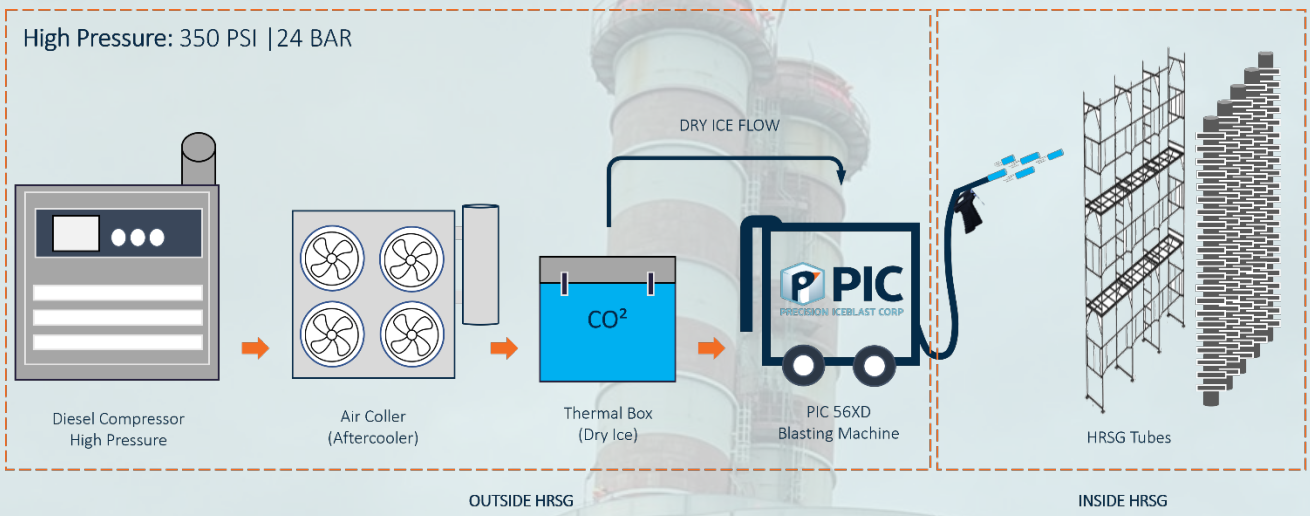
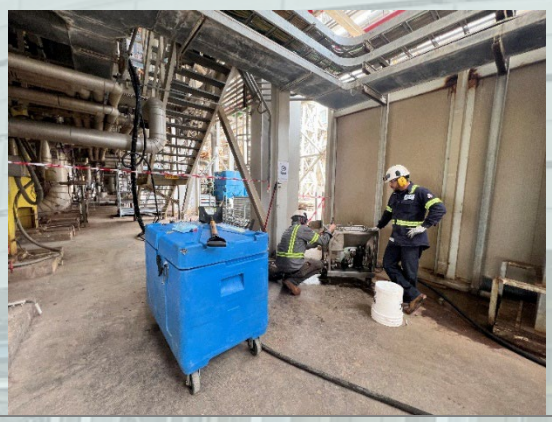


Figure 1.2 Blasting System Setup

PIC TOOLBOXES

HIGH PRESSURE COMPRESSOR



BLASTING MACHINE AND ICE TUBES

DRY ICE PELLETS - 3MM

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CHALLENGE

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To ensure better cleaning results, special tools were manufactured according to the configuration of the HRSG heat exchangers. A total of six faces were accessed by PIC's blast technicians who applied our deep cleaning methodology as illustrated in the diagram 1.3 below.

Prior to completion of our deep cleaning process on each face, the field service manager and supervisor carried out a thorough borescope inspections on three different levels of each face (Top, Middle and Bottom) to ensure quality standard of cleanliness was achieved.

The inspections were of fundamental importance in order to assess the quality of cleaning in the deeper tubes. This allowed our technical team to adjust our cleaning procedure to ensure that all heat transfer surface areas were cleaned effectively to obtain the maximum return of thermal efficiency and output.

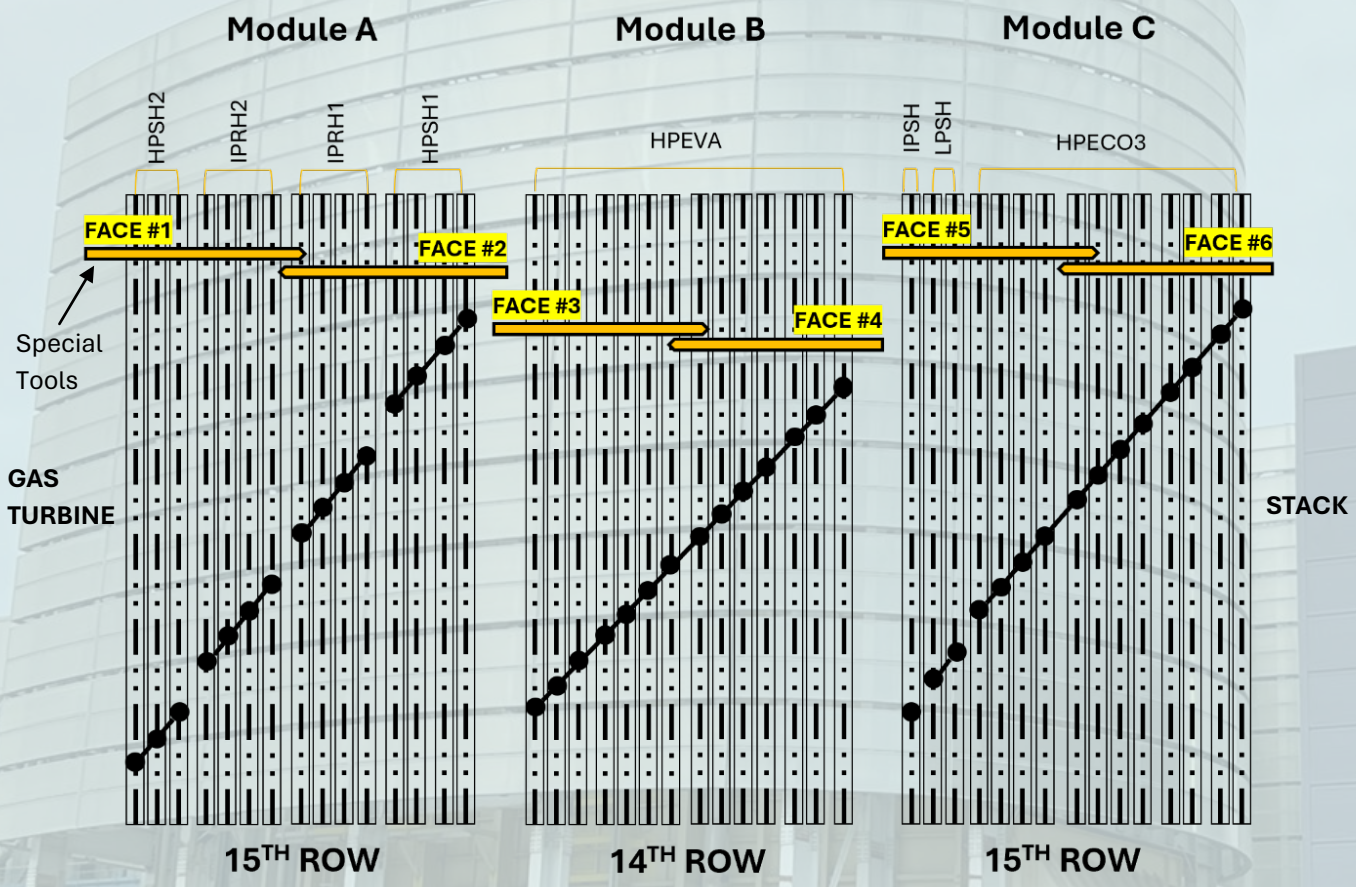

Diagram 1.3 illustrates the side view of the three heat exchanger modules where the HRSG Deep Cleaning TM procedure was applied. The cleaning began with the upstream face of module A (from top to bottom), then proceeded to the other faces until reaching the downstream side of module C.

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CHALLENGE

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The main challenge faced by PIC during the cleaning process of both HRSG units was to ensure the meticulous application of the deep cleaning procedure, **applying special tools with a "line-by-line"** approach as demonstrated **by the red dots in each of the 24 subdivided sections of module B**. These sections were heavily encrusted with compacted thermal insulation material in all deep rows of tubes.

To adhere to this rigorous cleaning protocol, **approximately 416 applications** of our specialized tools were required at each tie level, moving from left to right and vice versa. **This totaled approximately 2,490 applications** for each face (upstream and downstream side).

These numbers demonstrate the extent of the necessary cleaning and the meticulousness required to ensure the effectiveness of the deep cleaning process of the HRSG units.

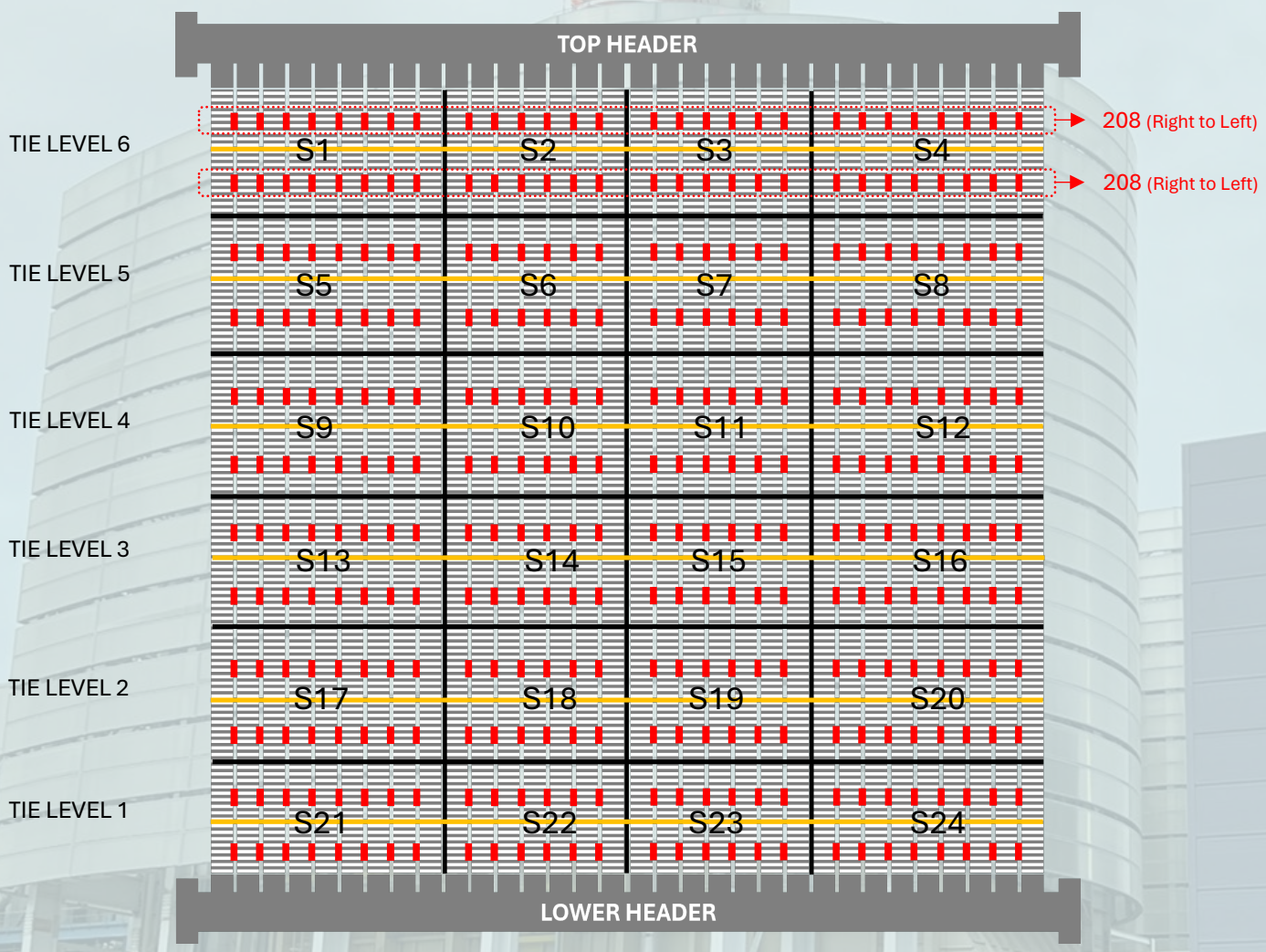

Figure 1.4 illustrates the front view of the tube face of module B with tie level divisions and tube sections. At tie level 6, the number of spread bar installations is demonstrated at both angles, totaling 416 installations per tie level.

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CLEANING RESULTS

HEATING SURFACE DEEP TUBES

BEFORE CLEANING	AFTER CLEANING
	
10TH Row of Tube	10TH Row of Tube
	
8TH Row of Tube	8TH Row of Tube
	
5TH Row of Tube	5TH Row of Tube
	
2ND Row of Tube	2ND Row of Tube

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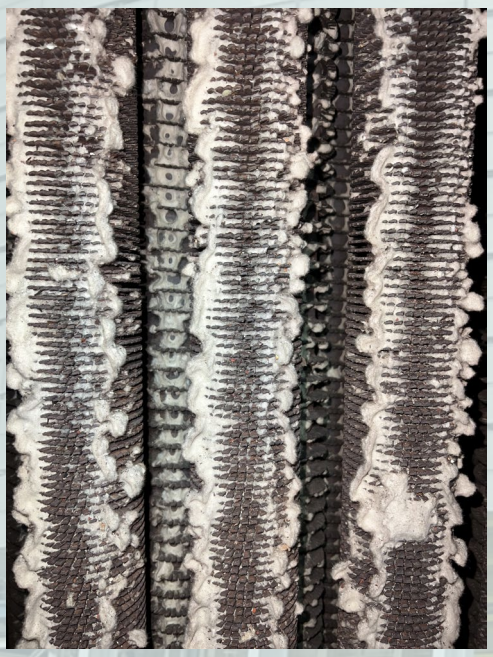
CLEANING RESULTS

HEATING SURFACE FIRST TUBES

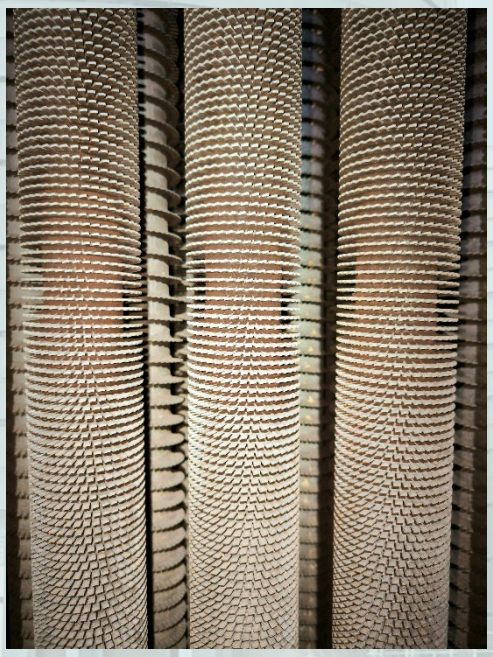
BEFORE CLEANING

AFTER CLEANING

BEFORE CLEANING



AFTER CLEANING



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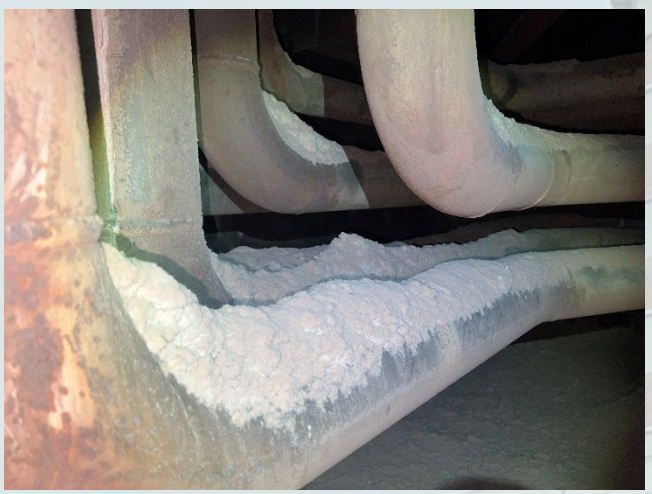
DEBRIS RESULTS

TONS REMOVED

APPROXIMATELY SIX TONS OF DEPOSITS REMOVED FROM BOTH HRSG UNITS



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BENEFITS

PERFORMANCE RESTORATION

GT POWER OUTPUT (MW)

- GT: 232 MW (Before)
- **GT: 252.6 MW (After)**

+ 20 MW

ST POWER OUTPUT (MW)

- 93 MW (Before)
- **110.3 MW (After)**

+ 17 MW

GT BACKPRESSURE REDUCTION

- 68.2 mbar (Before)
- **32.0 mbar (After)**

- 36 mbar

STACK TEMPERATURE

- 106.5 °C (Before)
- **96.9 °C (After)**

- 9.6 Celsius

ANNUAL SAVING

- With 8.000 operation hours, 0.085 USD/kWh = **$25.5 million USD**

PRECISION ICEBLAST CORPORATION

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