Superwool® Prime Modules: Heat Treatment Furnace

Morgan Advanced Materials

Industry: Iron and Steel
Application: Heat Treatment Furnace
Product Solutions: Superwool Prime Pyro-Fold™ Modules
Location: Asia

August 2023

The Challenge and Application Overview

With a global focus and commitment from the iron and steel industry to reduce carbon emissions by 2050, the industry now needs to cope with the pressure to reduce its carbon footprint from both environmental and economic perspectives.

An area of focus is the more efficient use of advanced thermal insulation materials to improve these energy-intensive applications across the Iron and Steel industry.

Lined with traditional refractory ceramic fibre (RCF) modules, the customer is seeking to reduce heat loss in the heat treatment furnace with improved thermal insulation furnace lining without 1b carcinogen classification (RCF is classified as a category 1b carcinogen in Europe).

By partnering with Morgan on the design and installation of an optimum insulation lining, the customer expects to:

- Lower cold face temperature by 5 to 10 degrees
- Reduce energy loss, power consumption and carbon emission
- Successful conversion to safer, low biopersistent fibre insulation lining

Solution

After review of existing lining design and thermal analysis, Morgan recommended the use of Superwool Prime Pyro-Fold Modules, our latest low biopersistent fibre with a classification temperature of 1300°C and improved thermal conductivity.

In the table below, we show the performance of the proposed lining compared with that of the traditional, existing lining used by the customer. With Superwool Prime Pyro-Fold Modules, we illustrate how achieve the customers expectations by reducing the cold face temperature by 6 degrees and achieving up to 20% heat loss reduction.

Solution and Results	Existing Lining	Proposal
Design	RCF Module, 300mm RCF Blanket, 50mm	Superwool Prime Pyro-Fold Module, 300mm RCF Blanket, 50mm
Total Heat Loss (calculated)	403.8 w/m^2	322.4 w/m^2
Heat Storage MJ/m^2 (calculated)	47.7	46.6
Cold Face Temperature (calculated)	64°C	58°C
Actual Measurement: Cold face temperature reduction with proposed system		**6 degree reduction**
Key Benefit		**Energy reduction and more sustainable furnace lining**

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Figure 1: Newly installed Superwool Prime Pyro-Fold™ Modules

Figure 2: Superwool Prime Pyro-Fold Modules, after 6 months use

Customer Impact

Our team, partnering with the customer were able to design, engineer, supply and support installation of the proposed system for optimal thermal insulation performance.

Post-performance reviews were conducted with thermography and visual inspection of lining integrity, after 6 months in-service The cold face temperature of heat furnace installed with Superwool Prime Pyro-Fold Modules was compared with equivalent heat furnace installed with RCF modules, under similar operating conditions (holding at 940°C for 2 hours)

- Reduction of 6 degrees in cold face temperature at the furnace door

- No hot spots observed

- Superwool Prime Pyro-Fold Modules were in good condition when visually inspected

- Successful conversion from RCF to low biopersistance fibre with improved thermal performance

Our customer was satisfied with the performance of the Superwool Prime module performance and will expand the use to more furnaces in the future.
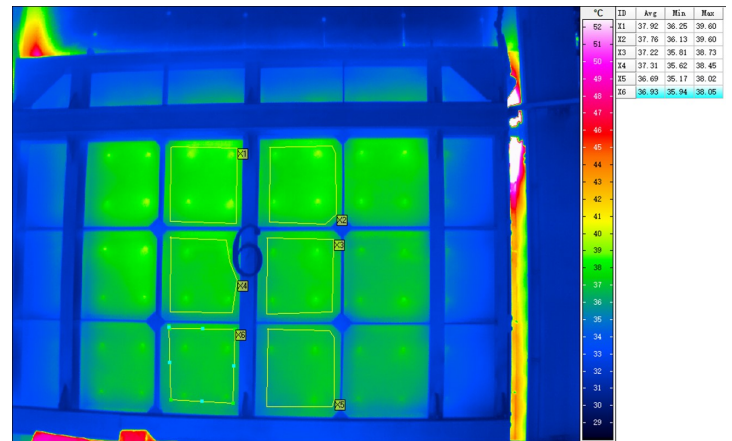

Figure 3: Thermography of furnace with Superwool Prime Pyro-Fold Modules, no hot spots observed
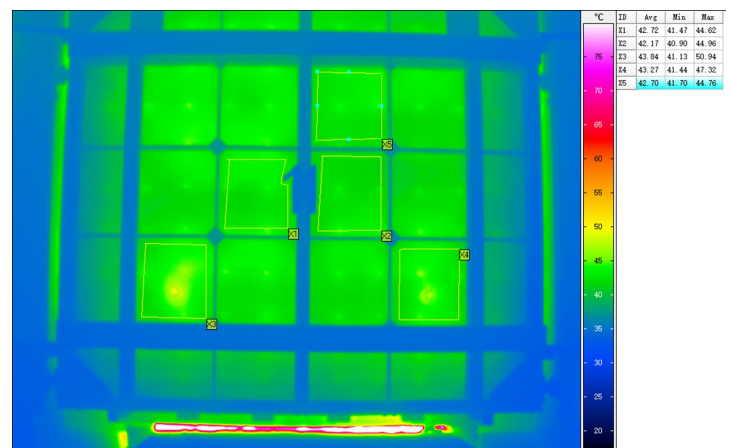

Figure 4: Thermography of furnace with RCF module, measured average cold face temperature is higher by average of 6 degrees