



Drive Profit and Decarbonization in Fired Heaters with High Emissivity Coating



TEXPLORE COMPANY LIMITED

Dr. Jaturong Jitputti

Page | 1

improves thermal efficiency without process modification

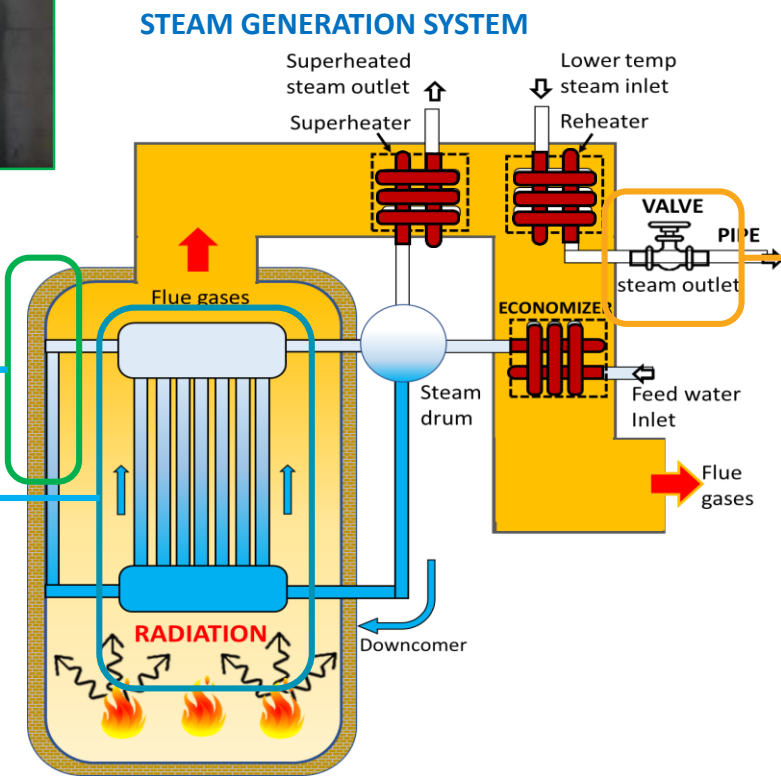
R-SERIES
Refractory Coating

- Reduce energy consumption
- Reduce CO₂ emissions
- Prolong refractory life
- Improve radiant heat transfer efficiency



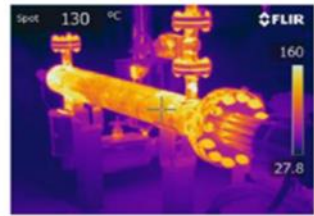
T-SERIES
Tube Coating

- Reduce energy consumption
- Reduce CO₂ emission
- Oxidation Corrosion Protection
- Improve surface heat absorption capability

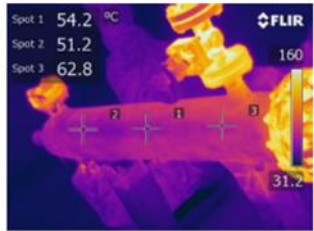


I-SERIES
Insulation Coating

- CUI prevention
- Energy efficiency
- Comfort environment

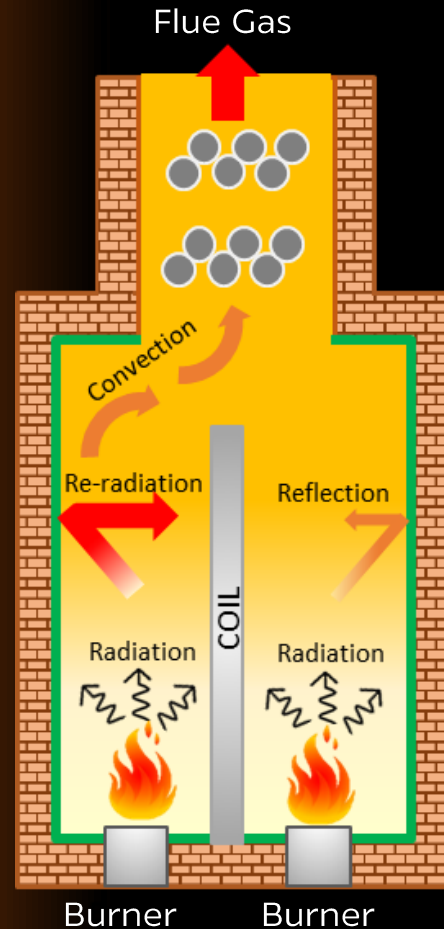


Reduced 70°C (126°C ⇒ 55°C)



Modes of Heat Transfer

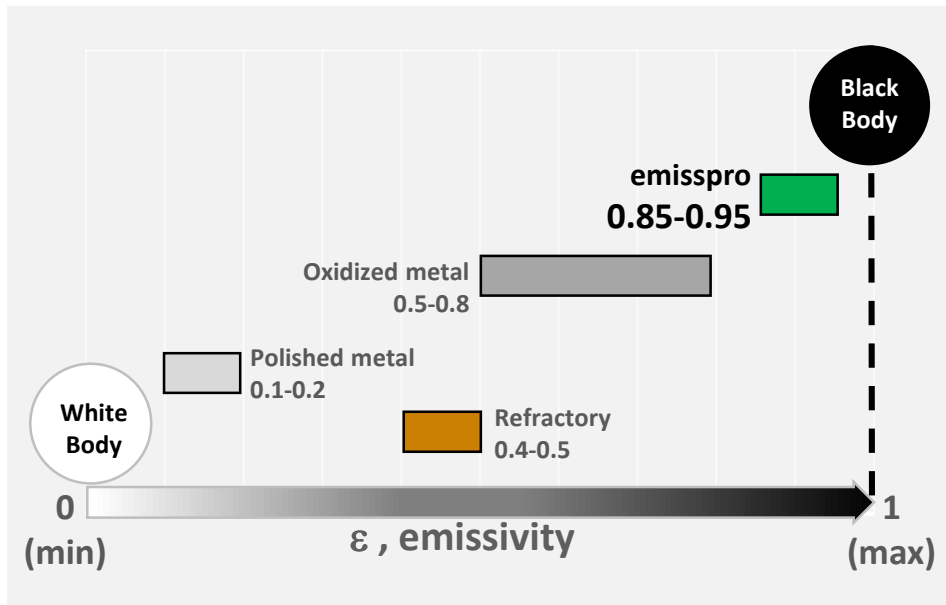
- ***Radiation***
- ***Conduction***
- ***Convection***



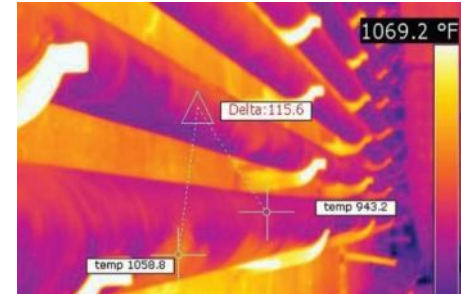
90% of heat transfer in high-temperature furnaces/boilers is by ***Radiation*** $\sigma \epsilon AT^4$

Emissivity , ϵ

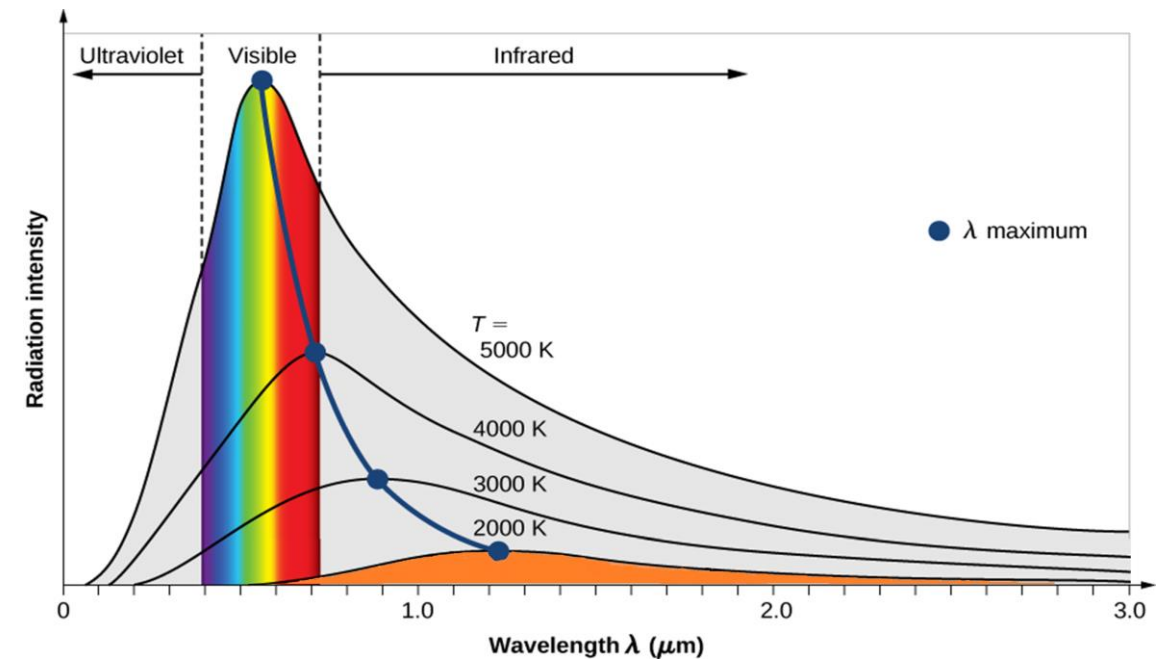
- Ability of a material to absorb and re-emit radiant energy
- A **BLACK BODY** has an emissivity of 1
- A **WHITE BODY** (perfect reflector) has an emissivity of 0
- All materials possess emissivity between 0 and 1



$$\text{emissivity (E)} = \text{absorptivity (A)} = 1 - \text{Reflectivity (R)}$$

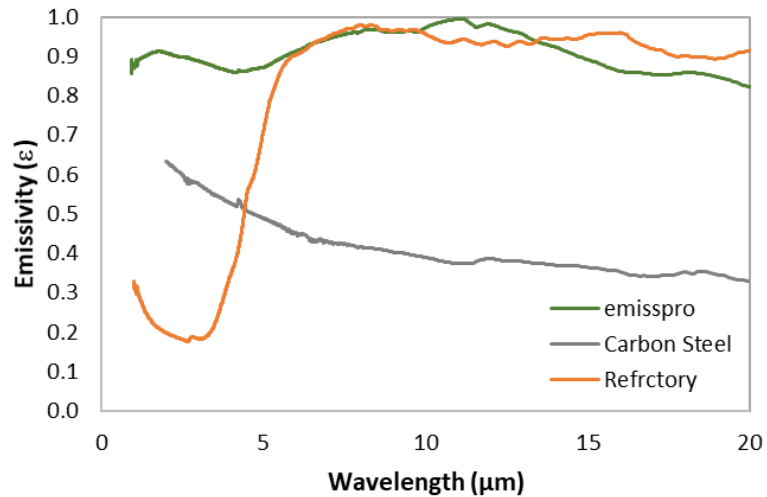


Infrared (IR) Radiation: A broad range of wavelengths **invisible to the human eye** but perceived as heat. In industrial furnaces, the vast majority of heat transfer occurs via infrared radiation.



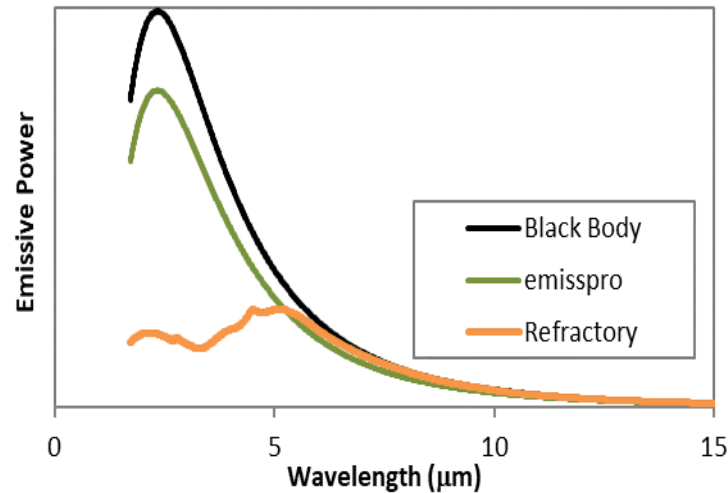
emisspro[®]: High Emissivity Coating

Spectral Emissivity



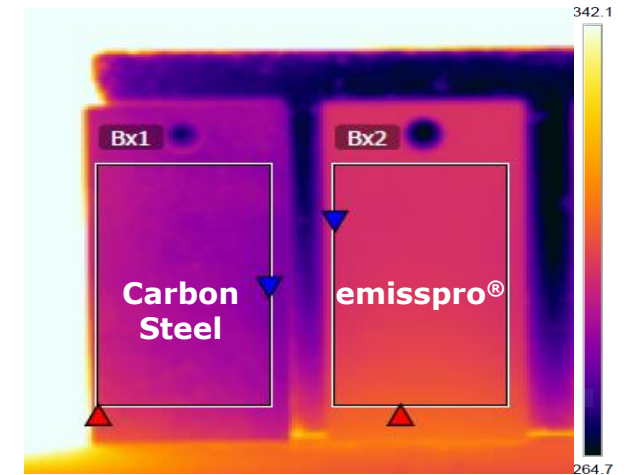
**emisspro[®] Possesses
HIGH SPECTRAL EMISSIVITY**

Emissive Power



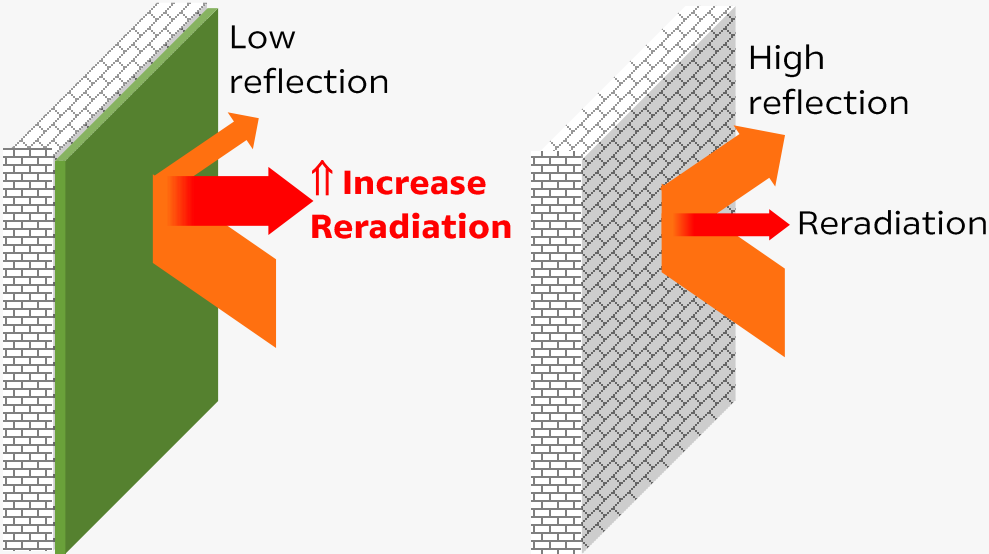
**emisspro[®] Emits
HIGH EMISSIVE POWER**

Infrared Thermal Imaging



**emisspro[®] Exhibits
HIGH THERMAL RADIATION**

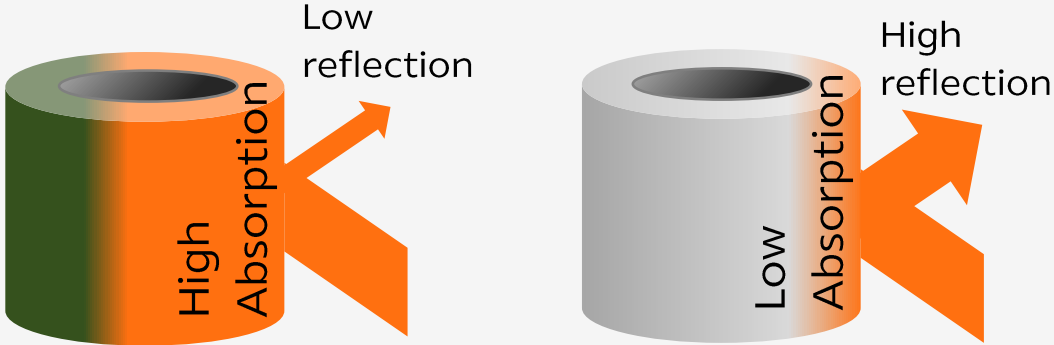
Refractory Materials with high emissivity at **INFRARED** region can absorb and reradiate high thermal radiation



HIGH EMISSIVITY MATERIAL

HIGH EMISSIVITY	LOW REFLECTIVITY
High energy reradiated to load >> Higher Production	Less energy carried away by flue gas

Tube/Coil with high absorptivity at **INFRARED** region can absorb high thermal radiation

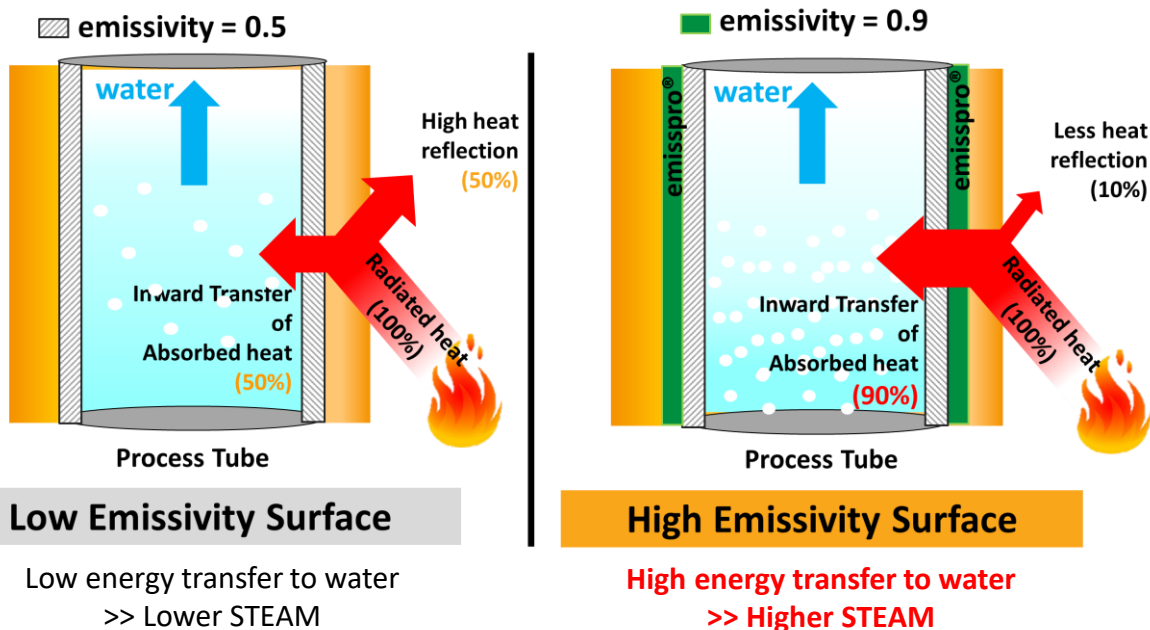


HIGH EMISSIVITY MATERIAL

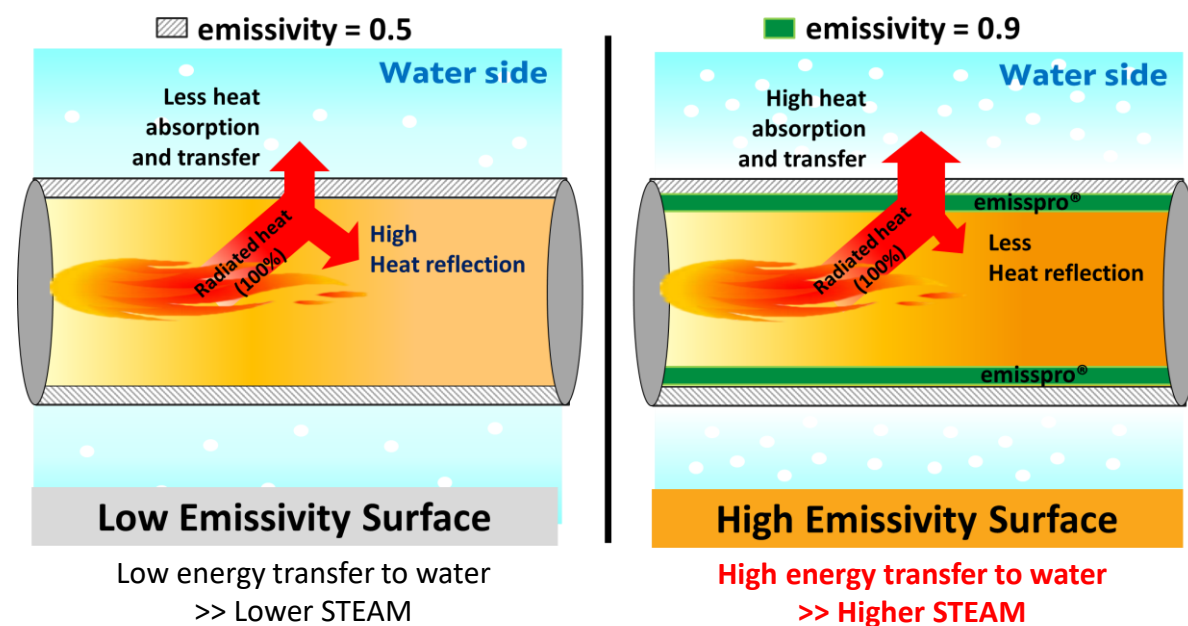
HIGH ABSORPTIVITY	LOW REFLECTIVITY
High energy transfer to water >> Higher STEAM	Less energy carried away by flue gas

emisspro® T-Series improves the absorptivity of radiant tubes, **Reducing ‘Heat Reflection’ and **Increasing ‘Heat Radiation/Absorption’**, allowing water to receive more energy.**

Water Tube Coating



Fire Tube Coating



Benefits of emisspro® R-Series and T-Series

Reduce Fuel Costs: Reduce fuel consumption by 5% or more, directly lowering operational expenses.

Less Emissions: Lower fuel use significantly cuts CO₂ and NO_x, helping you meet environmental and compliance goals.

Boost Production: Increase throughput and capacity with faster heat-up rates and shorter cycle times.

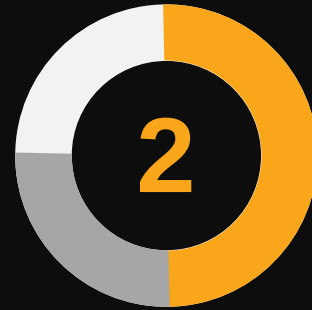
Extend Asset Life: Protect critical equipment from heat and corrosion to minimize downtime and extend operational life.

Achieve Rapid ROI: Deliver a fast return on investment driven by immediate and substantial fuel savings.

Coating Implementation

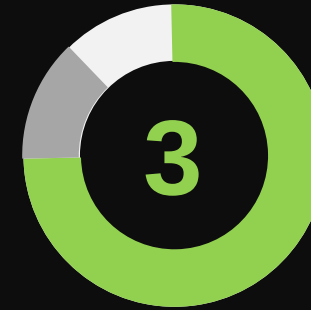


Preliminary Assessment



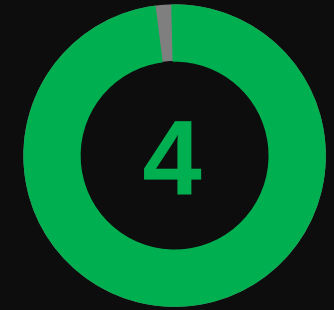
Simulation & Feasibility

- Fuel savings
- CO₂ reductions
- ROI



Coating Installation

- Cleaning
- Coating
- Inspection



Energy Saving Verification



improves thermal efficiency without process modification

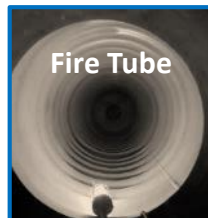
R-SERIES Refractory Coating

- Reduce energy consumption
- Reduce CO₂ emission
- Prolong refractory life

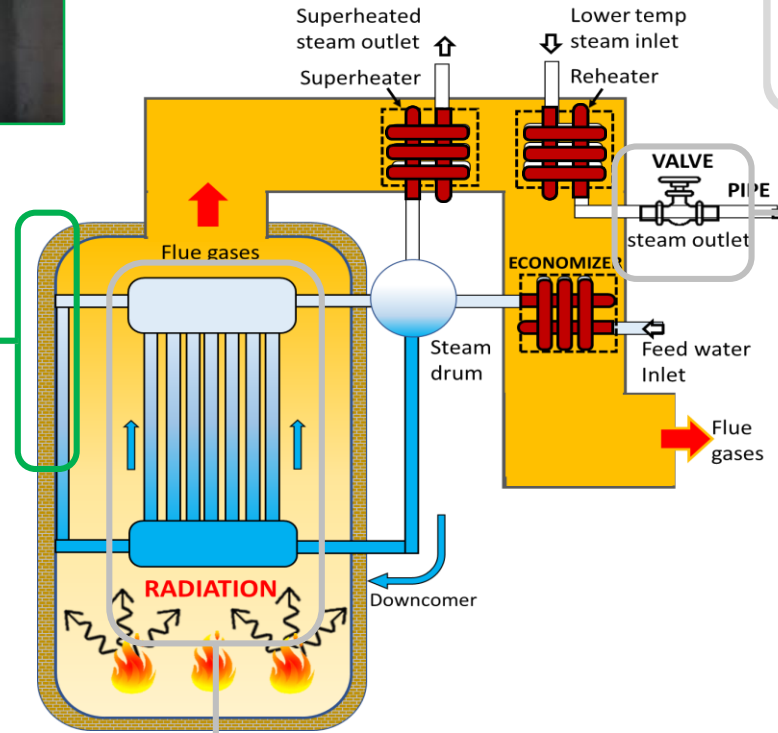


T-SERIES Tube Coating

- Reduce energy consumption
- Reduce CO₂ emission
- Oxidation Corrosion Protection

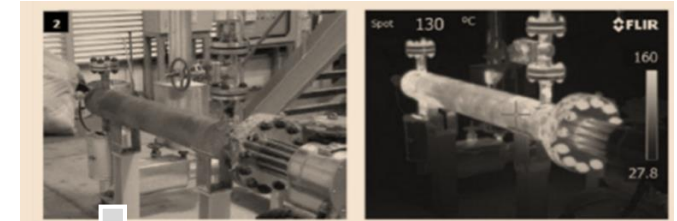


STEAM GENERATION SYSTEM

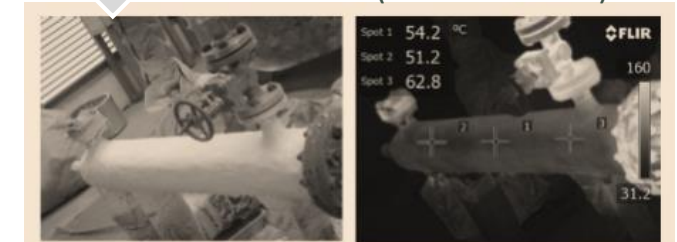


I-SERIES Insulation Coating

- CUI prevention
- Energy efficiency
- Comfort environment



Reduced 70°C (126°C ⇒ 55°C)



Project Reference: emisspro R-SERIES

Project: Naphtha cracking (Refractory Coating)
Licensors: TECHNIP



Designed Capacity : 70 Ton/hour
Fuel Type: Natural Gas

Parameter	Before Coating	After Coating
Energy supply	90.82 Gcal/hr	89.46 Gcal/hr
Energy reduction	-	1.36 Gcal/hr
CO ₂ emission	170,236 ton CO ₂ eq/year	167,687 tonCO ₂ eq/year
Net energy saving	Est. > 1.1 %	1.5%
CO ₂ reduction	-	2,549 tonCO ₂ eq/year
Cost saving	-	17 MB/year

Project: Naphtha cracking (Refractory Coating)
Licensors: LUMMUS



Designed Capacity : 50 Ton/hour
Fuel Type: Natural Gas

Parameter	Before Coating	After Coating
Energy supply	64.0 Gcal/hr	63.2 Gcal/hr
Energy reduction	-	0.8 Gcal/hr
CO ₂ emission	119,964 ton CO ₂ eq/year	118,464 tonCO ₂ eq/year
Net energy saving	Est. > 1.0 %	1.6%
CO ₂ reduction	-	1,500 tonCO ₂ eq/year
Cost saving	-	13 MB/year

Project Reference: emisspro **R-SERIES**

Project: H₂ Reformer, SMR (Refractory coating)

Licensor: HALDOR TOPSOE



Designed Capacity : 50 Ton/hour

Fuel Type: Natural Gas

Parameter	Before Coating	After Coating
Energy supply	65.0 Gcal/hr	63.2 Gcal/hr
Energy reduction	-	1.8 Gcal/hr
CO ₂ emission	121,838 ton CO ₂ eq/year	118,464 tonCO ₂ eq/year
Net energy saving	Est. > 1.1 %	1.2%
CO₂ reduction	-	3,374 tonCO₂eq/year
Cost saving	-	29.5 MB/year

Project: H₂ Reformer, SMR (Refractory coating)

Licensor: FOSTER WHEELER



Designed Capacity : 50 Ton/hour

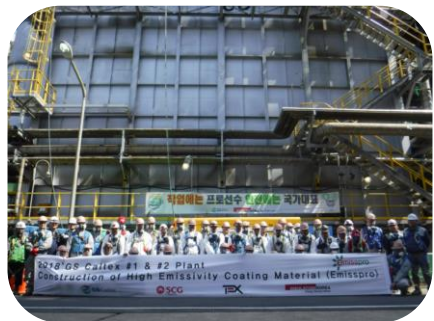
Fuel Type: Natural Gas

Parameter	Before Coating	After Coating
Energy supply	70.0 Gcal/hr	67.9 Gcal/hr
Energy reduction	-	2.1 Gcal/hr
CO ₂ emission	131,210 ton CO ₂ eq/year	127,274 tonCO ₂ eq/year
Net energy saving	Est. > 2 %	3.1%
CO₂ reduction	-	3,936 tonCO₂eq/year
Cost saving	-	27 MB/year

Project Reference: emisspro R-SERIES

Project: CCR Furnace (Refractory Coating)
Licensor: UOP

Designed Capacity : 260 Ton/hour
Fuel Type: Natural Gas



Parameter	Before Coating	After Coating
Energy supply	105.0 Gcal/hr	103.4 Gcal/hr
Energy reduction	-	1.57 Gcal/hr
CO ₂ emission	196,815 tonCO ₂ eq/year	193,816 tonCO ₂ eq/year
Net energy saving	Est. > 1.20 %	1.50%
CO ₂ reduction	-	3,000 tonCO ₂ eq/year
Cost saving	-	23 MB/year

Project: Atmospheric Pipestill Furnace (Refractory Coating)

Designed Capacity : 223 Ton/hour
Fuel Type: Fuel Gas



Parameter	Before Coating	After Coating
Energy supply	42.48 Gcal/hr	41.36 Gcal/hr
Energy reduction	-	1.12 Gcal/hr
CO ₂ emission	87,402 tonCO ₂ eq/year	85,103 tonCO ₂ eq/year
Net energy saving	Est. 1.20> %	2.64%
CO ₂ reduction	-	2,299 tonCO ₂ eq/year
Cost saving	-	14 MB/year

Project Reference: emisspro **R-SERIES**

Project: Naphtha Reheating Furnace
(Refractory Coating)

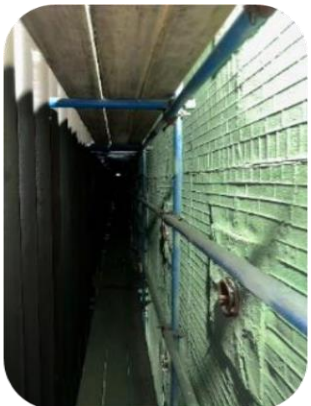
Designed Capacity : 100 Ton/hour
Fuel Type: Fuel Gas



Parameter	Before Coating	After Coating
Energy supply	11.76 Gcal/hr	11.52 Gcal/hr
Energy reduction	-	0.24 Gcal/hr
CO ₂ emission	24,200 tonCO ₂ eq/year	23,700 tonCO ₂ eq/year
Net energy saving	Est. >1.30%	2.04%
CO ₂ reduction	-	500 tonCO₂eq/year
Cost saving	-	3.2 MB/year

Project: Steam Methane Reformer
Licensors: Haldor Topsoe

Designed Capacity : 65 Ton/hour
Fuel Type: Fuel Gas



Parameter	Before Coating	After Coating
Energy supply	123.30 Gcal/hr	121.50 Gcal/hr
Energy reduction	-	1.80 Gcal/hr
CO ₂ emission	253,690 tonCO ₂ eq/year	249,900 tonCO ₂ eq/year
Net energy saving	Est. >1.22%	1.46%
CO ₂ reduction	-	3,790 tonCO₂eq/year
Cost saving	-	24 MB/year

Project Reference: emisspro **R-SERIES**

Project: Steam Reformer

Licensor: Lurgi

Designed Capacity : 50 Ton/hour

Fuel Type: Fuel Gas



Parameter	Before Coating	After Coating
Energy supply	53.50 Gcal/hr	52.76 Gcal/hr
Energy reduction	-	1.61 Gcal/hr
CO ₂ emission	100,461 tonCO ₂ eq/year	97,442 tonCO ₂ eq/year
Net energy saving	Est. 1.20> %	1.39%
CO₂ reduction	-	3,000 tonCO₂eq/year
Cost saving	-	13.5 MB/year

Project: Steam Reformer

Licensor: Lurgi

Designed Capacity : 41 Ton/hour

Fuel Type: Fuel Gas



Parameter	Before Coating	After Coating
Energy supply	74.01 Gcal/hr	72.99 Gcal/hr
Energy reduction	-	1.02 Gcal/hr
CO ₂ emission	138,980 tonCO ₂ eq/year	134,800 tonCO ₂ eq/year
Net energy saving	Est. >1.20%	1.38%
CO₂ reduction	-	4,180 tonCO₂eq/year
Cost saving	-	10 MB/year

emisspro® improves thermal efficiency without process modification



TNCHE Asia 2025

R-SERIES

Refractory Coating

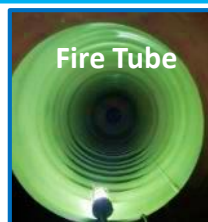
- Reduce energy consumption
- Reduce CO₂ emission
- Prolong refractory life



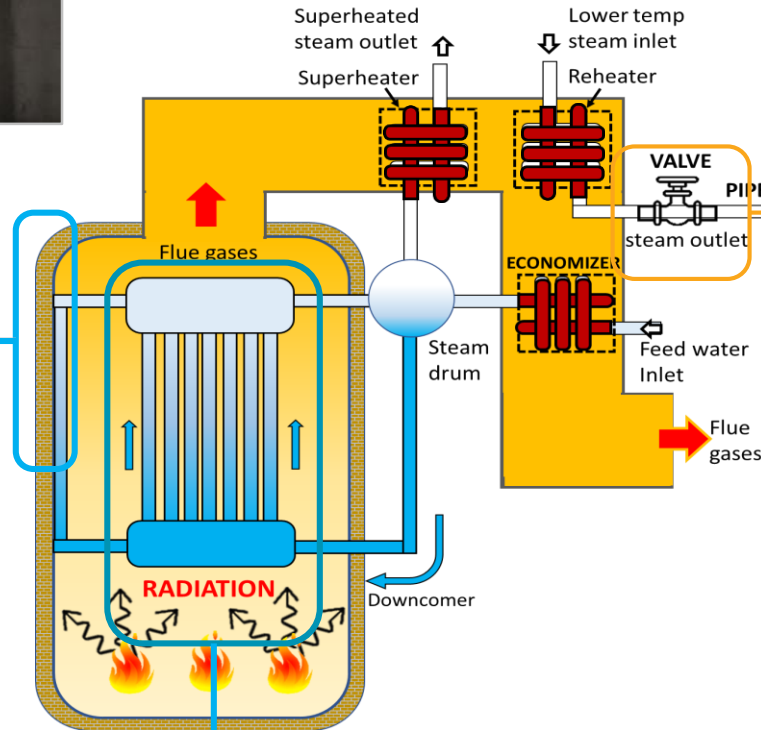
T-SERIES

Tube Coating

- Reduce energy consumption
- Reduce CO₂ emission
- Oxidation Corrosion Protection



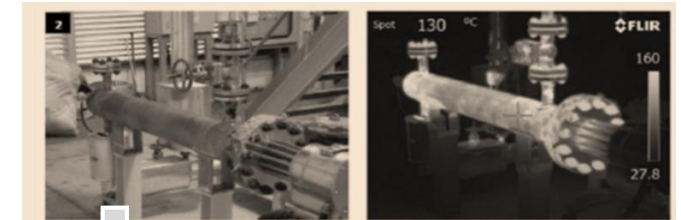
STEAM GENERATION SYSTEM



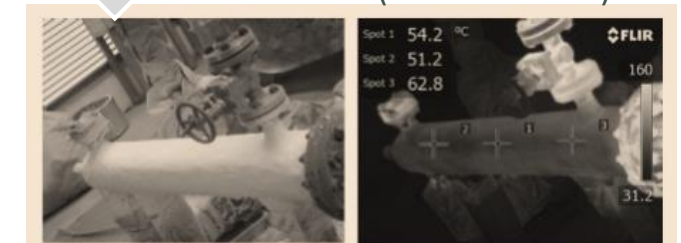
I-SERIES

Insulation Coating

- CUI prevention
- Energy efficiency
- Comfort environment

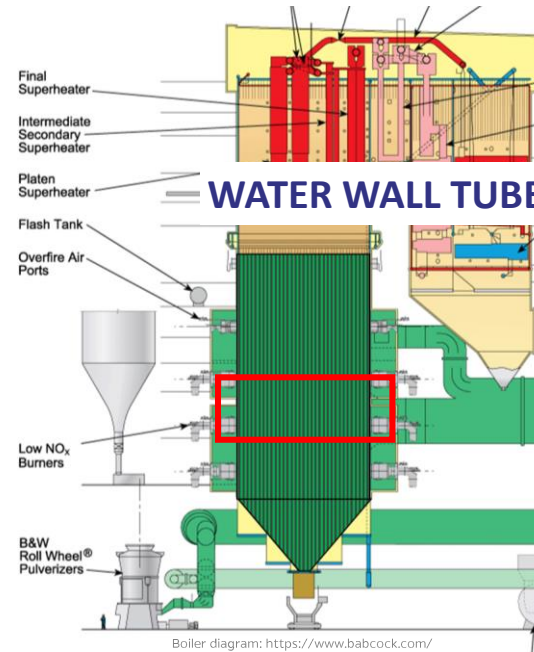


Reduced 70°C (126°C ⇒ 55°C)

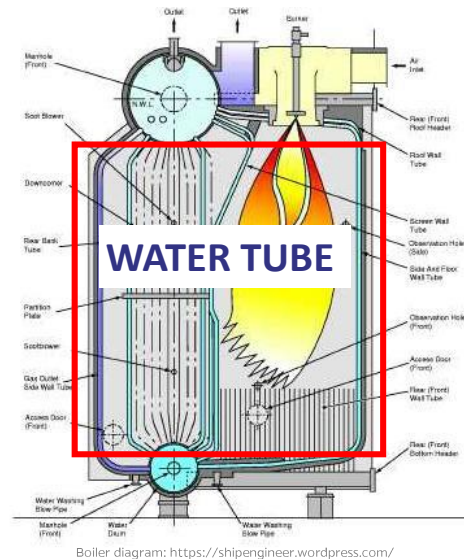


emisspro® T-Series Application in Boilers

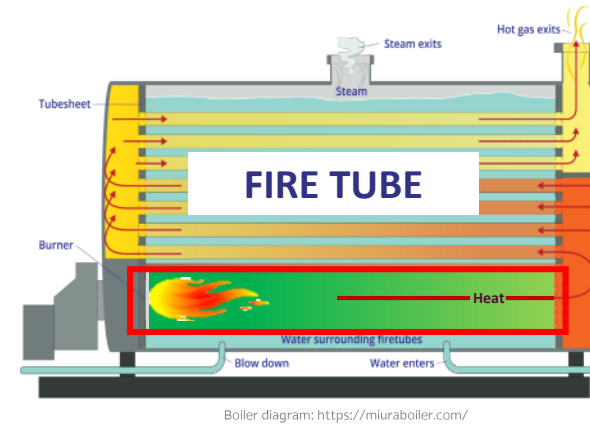
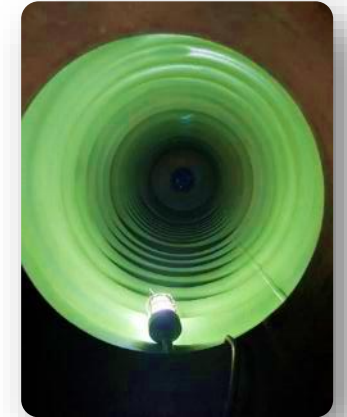
WATER WALL TUBE



WATER TUBE



WATER TUBE WALL



Project Reference: emisspro T-SERIES

Project: Fire Tube Boiler (Tube coating)

Licensor: Megatherm



Designed Capacity : 20 Ton/hour(Actual operating load: 16 Ton/hour)

Fuel Type: Natural Gas

Parameter	Before Coating	After Coating
Energy supply	7.86 Gcal/hr	7.77 Gcal/hr
Energy reduction	-	0.09 Gcal/hr
CO ₂ emission	15,794 ton CO ₂ eq/year	15,610 tonCO ₂ eq/year
Net energy saving	Est.> 1.0%	1.10%
CO₂ reduction	-	184 tonCO₂eq/year
Cost saving	-	1.2 MB/year

Project: Fire Tube Boiler (Tube coating)

Licensor: HANSA



Designed Capacity : 5 Ton/hour(Actual operating load: 2.5 Ton/hour)

Fuel Type: Natural Gas

Parameter	Before Coating	After Coating
Energy supply	2.80 Gcal/hr	2.73 Gcal/hr
Energy reduction	-	0.07 Gcal/hr
CO ₂ emission	5,248 ton CO ₂ eq/year	5,112 tonCO ₂ eq/year
Net energy saving	Est. > 2.0 %	2.58%
CO₂ reduction	-	136 tonCO₂eq/year
Cost saving	-	0.9 MB/year

Project Reference: emisspro T-SERIES

Project: Water Tube Boiler (Tube coating)

Licensors: GETABEC



Pa

Designed Capacity : 60 Ton/hour(Actual operating load: 22 Ton/hour)

Fuel Type: Natural Gas

Parameter	Before Coating	After Coating
Energy supply	17.39 Gcal/hr	16.96 Gcal/hr
Energy reduction	-	0.43 Gcal/hr
CO ₂ emission release	33,252 tonCO ₂ eq/year	31,522 tonCO ₂ eq/year
Net energy saving	Est. > 2.0%	2.47%
CO₂ reduction	-	1,730 tonCO₂ eq/year
Cost saving	-	5.6 MB/year

Project: Fire Tube Boiler (Tube coating)

Licensors: HANSA



I

Designed Capacity : 48 Ton/hour(Actual operating load: 20 Ton/hour)

Fuel Type: Natural Gas

Parameter	Before Coating	After Coating
Energy supply	15.42 Gcal/hr	15.13 Gcal/hr
Energy reduction	-	0.29 Gcal/hr
CO ₂ emission	29,490 ton CO ₂ eq/year	28,943 tonCO ₂ eq/year
Net energy saving	Est. > 1.5 %	1.85%
CO₂ reduction	-	547 tonCO₂eq/year
Cost saving	-	4 MB/year

Project Reference: emisspro T-SERIES

Project: Hydrocracking Unit (Tube Coating)

Licensors: FOSTER WHEELER

Designed Capacity : 50 Ton/hour

Fuel Type: Natural Gas



Pa

Parameter	Before Coating	After Coating
Energy supply	21.56 Gcal/hr	21.17 Gcal/hr
Energy reduction	-	0.39 Gcal/hr
CO ₂ emission	40,413 ton CO ₂ eq/year	39,682 tonCO ₂ eq/year
Net energy saving	Est. > 1.2 %	1.8%
CO₂ reduction	-	731 tonCO₂eq/year
Cost saving	-	5 MB/year

Project: Hydrocracking Unit (Tube Coating)

Licensors: FOSTER WHEELER

Designed Capacity : 210 Ton/hour

Fuel Type: Natural Gas



Parameter	Before Coating	After Coating
Energy supply	30.8 Gcal/hr	30.3 Gcal/hr
Energy reduction	-	0.5 Gcal/hr
CO ₂ emission	57,733 ton CO ₂ eq/year	56,795 tonCO ₂ eq/year
Net energy saving	Est. > 1.2 %	1.6%
CO₂ reduction	-	937 tonCO₂eq/year
Cost saving	-	6.5 MB/year



R-SERIES

Refractory Coating

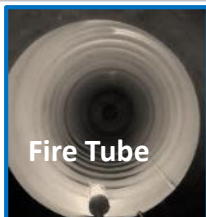
- Reduce energy consumption
- Reduce CO₂ emission
- Prolong refractory life



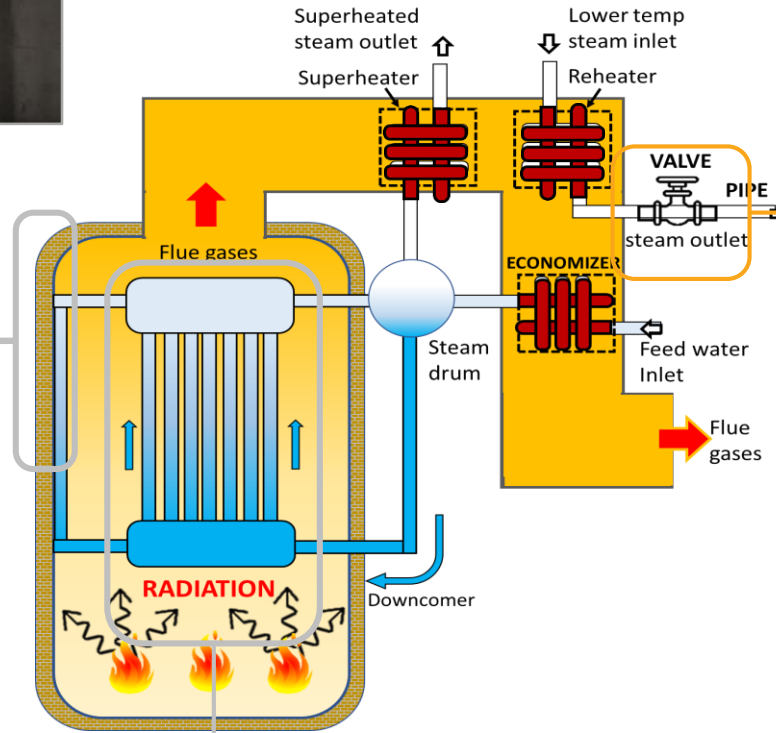
T-SERIES

Tube Coating

- Reduce energy consumption
- Reduce CO₂ emission
- Oxidation Corrosion Protection



STEAM GENERATION SYSTEM



I-SERIES

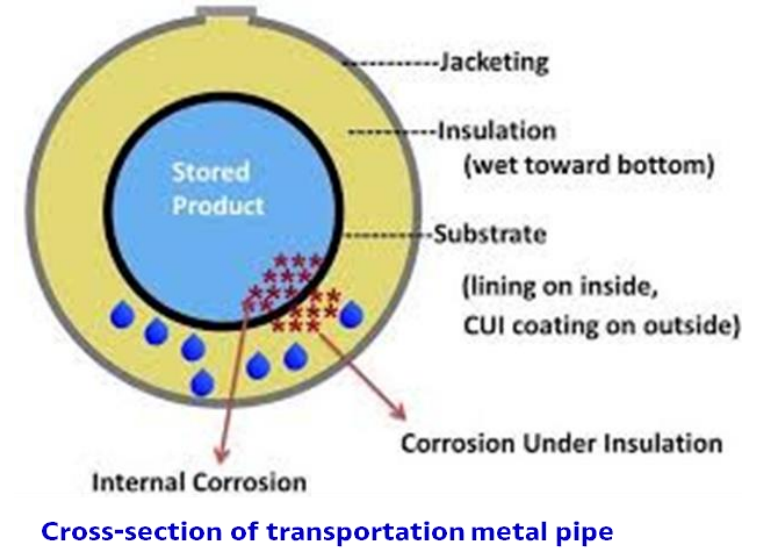
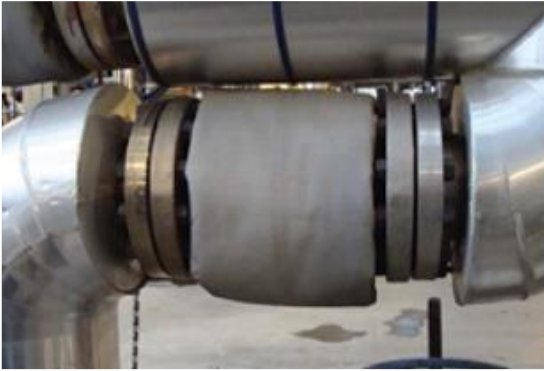
Insulation Coating

- CUI prevention
- Energy efficiency
- Comfort environment



TRADITIONAL INSULATION PROBLEMS

A Poorly Installed Insulation / Incomplete Insulation



Corrosion Under Insulation (CUI)



- High moisture absorption of insulation materials
- Improperly installation of cladding/jacket can lead to rain leaks
- Hard to install at elbow, valve, etc.
- Cladding / jacket damaged from maintenance work.

Traditional Insulation vs. emisspro® I-Series

Traditional Insulation

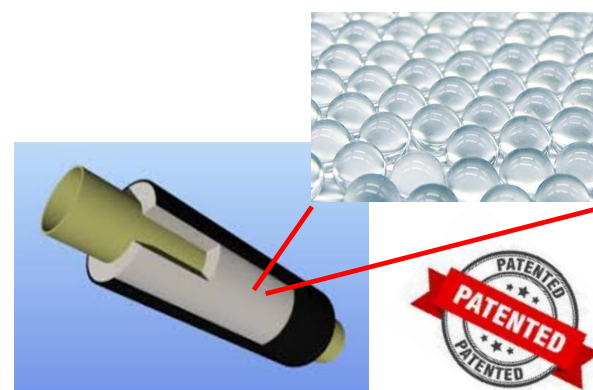
- Requires shutdown during installation
- High maintenance costs
- Allows moisture penetration
- Develops corrosion rapidly
- Degrades when exposed to moisture; valves and elbows are not effectively wrapped.

emisspro® I-Series

- **Applicable on operating equipment without shutdown (online coating)**
- **Low maintenance**
- **No condensation issues**
- **Prevents moisture penetration**
- **Can be inspected directly on-site for crack detection and is easily repairable**



Novel Insulation Materials



CO2 and Energy Loss Reduction



CO₂ reduction

Bare surface	: 6827 kg CO ₂ /year/m ²
Rockwool	: 525 kg CO ₂ /year/m ² (- 92.3%)
I-series	: 254 kg CO ₂ /year/m ² (- 96.3%)



Energy loss per year

Bare surface	: 28 MW/m ²
Rockwool	: 2.2 MW/m ²
I-series	: 1.0 MW/m ²



Rockwool

Condition : low stream pressure (143 C)
with
ambient temp 30 C
Insulation thickness : 3 cm
Tube mat. : steel
Tube orientation : vertical
Tube size : 50.8 mm



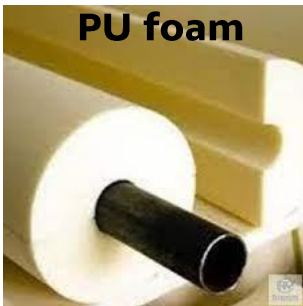
CO₂ reduction

Bare surface	: 1853 kg CO ₂ /year/m ²
PU foam	: 32 kg CO ₂ /year/m ² (- 98 %)
I-series	: 31 kg CO ₂ /year/m ² (- 98 %)



Energy loss per year

Bare surface	: 264 W/m ²
PU foam	: 4.5 W/m ² (- 98 %)
I-series	: 4.4 W/m ² (- 98 %)



PU foam

Condition : coolant temp (5 C)
with ambient temp 30 C
Insulation thickness : 5 cm
Tube mat. : steel
Tube orientation : vertical
Tube size : 50.8 mm



Anti-CUI

Project Reference: Aluminum Melting Furnace



Without Emisspro® I-Series
(Surface Temperature 130 °C)



After Coating
Emisspro® I-Series
(Surface Temperature 50 °C)



Project Reference: Heat Exchanger Coating



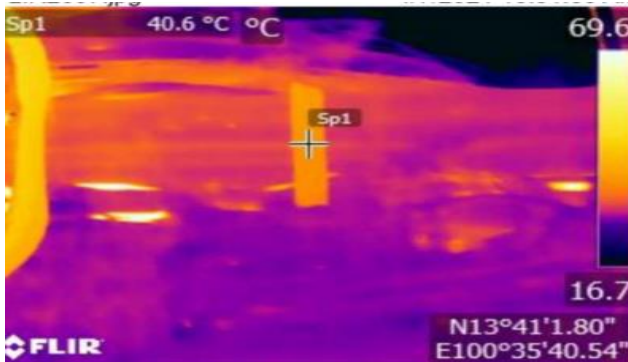
Before
emisspro® I-Series

Surface Temperature
(107 °C)

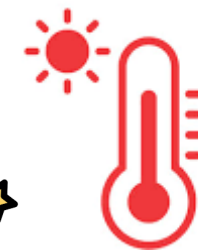


After Coating
emisspro® I-Series

Surface Temperature
(40 °C)



Project Reference: Superheat Header



Before

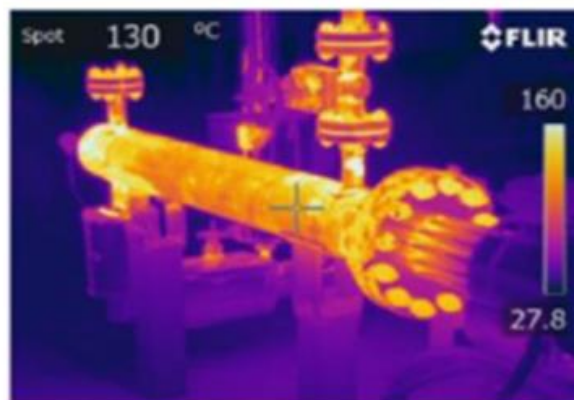
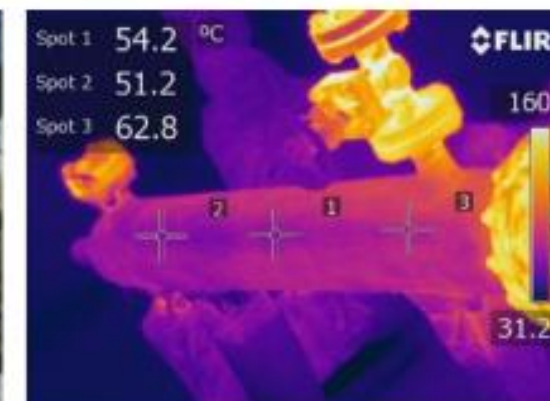
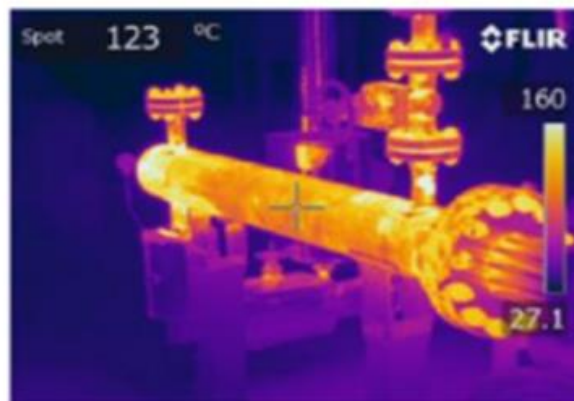
(Surface Temperature 126 °C)

After Coating

Emisspro® I-Series



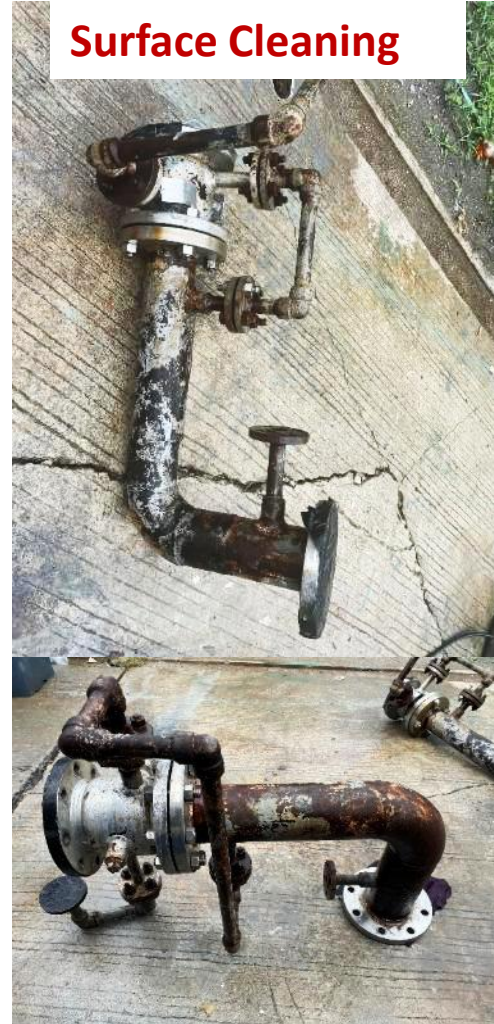
(Surface Temperature 55 °C)



Project Reference: Pipe



Original



Surface Cleaning



With Emisspro® I-Series

Project Reference: STEAM VALVE



Before

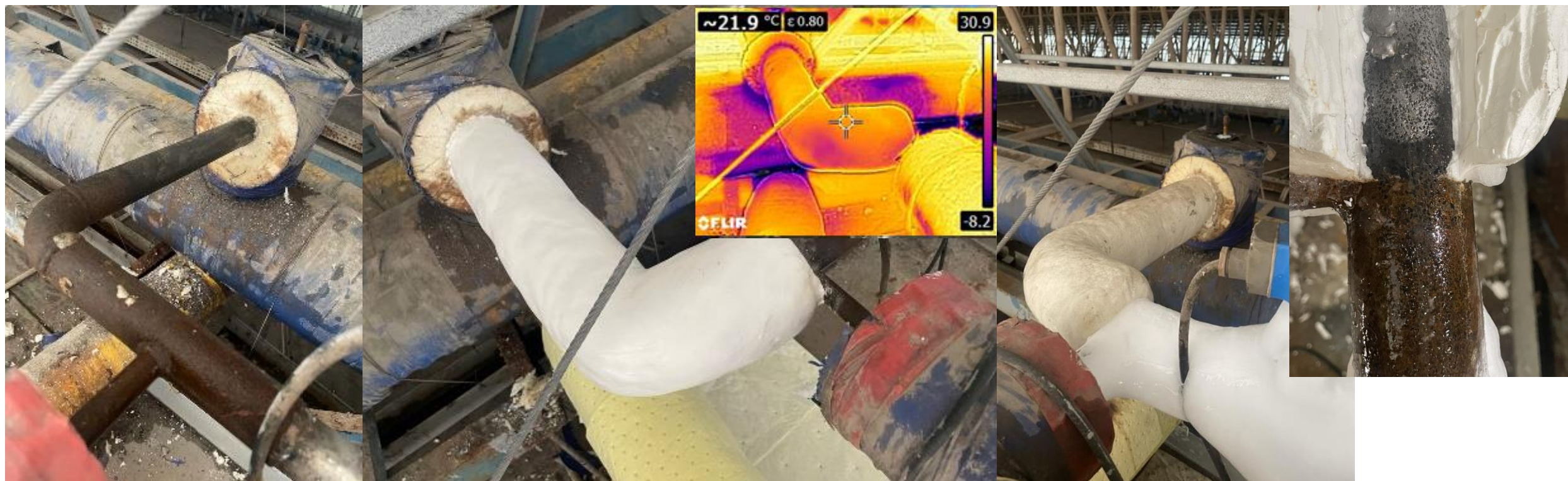
After coating
Emisspro® I-Series
(Reduce temperature 100 °C)





Project Reference: Coolant Pipeline

Liquid coolant flow in metal pipe with **-30 C**



After 6 months, I-series could efficiently protect tube from CUI

Summary

R-SERIES Refractory Coating

- Reduce energy consumption
- Reduce CO₂ emissions
- Prolong refractory life
- Improve radiant heat transfer



T-SERIES Tube Coating

- Reduce energy consumption
- Reduce CO₂ emission
- Oxidation Corrosion Protection
- Improve surface heat absorption



I-SERIES Insulation Coating

- CUI prevention
- Energy efficiency
- Comfort environment



Texplore



Established
2011



Core Focus
Energy-saving
coatings &
furnace solutions

Texplore



Key Technologies
emisspro®,
EXCENE™ HDPE,
PCM materials



Global Partners
Lummus Tech,
PCS
major
refineries /
petrochemical
clients



Operational Edge
Patented tech,
R&D expert teams

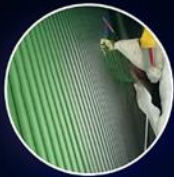
Integrated
Furnace
Solutions (IFS)

Catalyst &
Licensing

Energy
Solutions

Well Being

Advance
Additives



emisspro



EL-CAT



SCGC
Floating Solar
Solutions



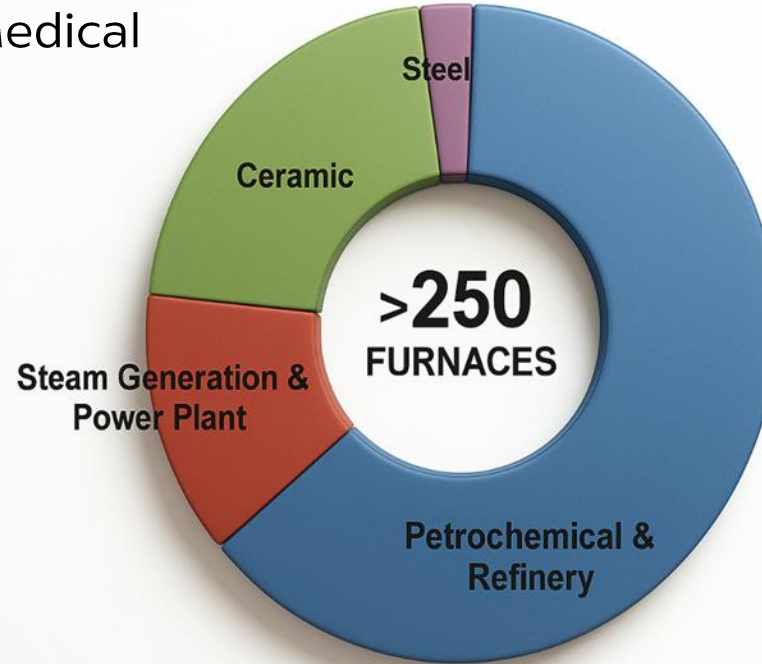
VAROGARD



EcoSoft
EcoClear-PP

Texplore's emisspro® Coating Experience in Industrial Furnaces

Medical



YEOCHUN NCC



COTTO



LOTTE CHEMICAL



GSteel



UBE



GS Caltex



TPC

Petrochemical
Corporation Singapore





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Q & A

