



Case History

Application: Steel Coupons Tested for Heat Transfer

Operating Temperature: Up to 704°C

Emisshield® Product Used: Emisshield® M-1, sintered and unsintered (patent pending)

Heat Transfer Data

Test Sample	Time to Reach Avg. Temp. = 593° C	% Reduction in Time to Temp	Time to Reach Avg. Temp. = 704° C	% Reduction in Time to Temp
Bare Steel	24.2 minutes	N/A	27.8 minutes	N/A
Emisshield® M-1	20.4 minutes	15.7%	24.1 minutes	13.3%
Emisshield® M-1 Sintered	20.2 minutes	16%	23.8 minutes	14%

These test results were obtained using cone calorimeter procedures. As indicated above, Emisshield® coated samples came to temperature ~15% quicker in time as a result of the high emissivity of the coating. These results may also be seen in boilers and heat exchangers. This data shows an increase in heat transfer from the heat source to the metal.

Areas Emisshield® Coatings will have a benefit:

- ~ Outer Diameter of Boiler Tubes
- ~ Refractory in firebox

Emisshield® Coatings:

- ~ Resulted in a coated piece of steel coming up to temperature on the back face 25% quicker than an uncoated piece in testing done by an independent laboratory
- ~ May increase heat flux rate across the tubes up to 15%. At steady state the potential fuel savings are 2% to 10%
- ~ Result in more uniform heat transfer across the tube
- ~ Protect the boiler tubes against the formation of surface oxide helping to increase heat transfer and tube life
- ~ Reduce thermal stress on the metal which can prolong the life
- ~ Can be applied to both boiler tubes and the surrounding refractory
- ~ Increase the heat transfer efficiency of the entire fire box if refractory is coated

Potential Benefits of Emisshield® Coatings can be viewed in several ways:

- ~ **Reduction of Fuel Usage:** Many boilers are computer controlled and will automatically cut back the fuel showing an immediate savings.
- ~ **Increase in Productivity:** If the firing rate is kept constant, the through-put can be increased until the desired level of production is reached.
- ~ **Decrease Time to Operating Temperature:** When a boiler is brought up to temperature, the time to reach operating temperature may be reduced by up to 20%.
- ~ **Reduction of Fly Ash Accumulation and Abrasion:** Emisshield® Coatings reduce abrasion accumulation of fly ash because of the coatings unique chemistry.

Notes:

1. Boiler companies may report that tubes already have an emissivity of 0.8, but that is usually not the case at the high operating temperatures over a prolonged period of time while Emisshield® can maintain its emissivity of 0.85 to 0.9 under proper application and use conditions.
2. Measuring emissivity has been, to date, difficult without an agreed-upon standard for testing emissivity.

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