Tillu Thermosys

Anant Enterprises, Pimpri MIDC

Project for Thermal Coating for Melting Furnace & Fuel Cost Saving

Date : 15th October, 2017

Contents

Formula for Heat Loss From Surface Area

Method 1: Radiation Heat Loss from Surface of Furnace

The quantity of heat loss from surface of furnace body is the sum of natural convection and thermal radiation. This quantity can be calculated from surface temperatures of furnace. The temperatures on furnace surface should be measured at as many points as possible, and their average should be used. If the number of measuring points is too small, the error becomes large.

The quantity (Q) of heat release from a reheating furnace is calculated with the following formula:

$$Q = a \times (t_1 - t_2)^{5/4} + 4.88E\left[\left(\frac{t_1 + 273}{100}\right)^4 - \left(\frac{t_2 + 273}{100}\right)^4\right]$$

where

Q	:	Quantity of heat release in kCal / W / m^2
a	:	factor regarding direction of the surface of natural convection ceiling = 2.8, side walls = 2.2, hearth = 1.5
t_1	:	temperature of external wall surface of the furnace (°C)
t_2	:	temperature of air around the furnace (°C)
E	:	emissivity of external wall surface of the furnace

The first term of the formula above represents the quantity of heat release by natural convection, and the second term represents the quantity of heat release by radiation.

This formula indicates **External Wall Temperature t_1** is very critical to reduce heat loss.

For 1sq meter if we reduce surface temperature by 12°C we save 0.4 Kg of FO per day i.e. Approx Rs. 10 per day per Sq Meter.

Source : Bureau of Energy Efficiency Manual

Project for Energy Conservation through Thermal Insulation Coating for **Melting Furnace : Internal & External Shell** **Fuel : Furnace Oil**

Furnace shell cleaned & Initial HR Paint removed

Outside Surface Coated with HRTI-400

Inside Surface Coated with HRTI-400

Project for Energy Conservation through Thermal Coating for Melting Furnace: **For Cold Bricks**

Furnace Base **with** HRTI 1200

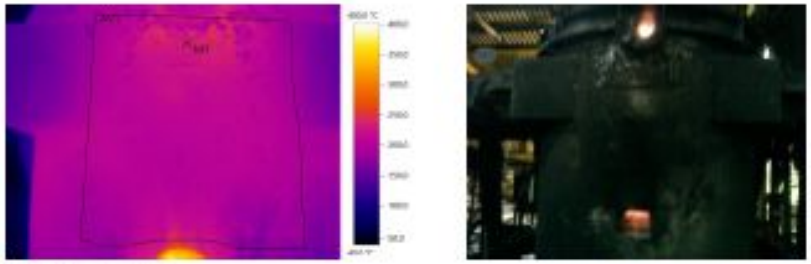
Cold Bricks Wall **without** HRTI 1200

Cold Bricks Wall **with** HRTI 1200

Melting Furnace : Pouring spout Front side

Before Cycle Time: 90 mins

File: IR000268 Pouring spout Front side.BMT
Date: 20-08-2017
lens type: 35° x 26°
lens serial no.:
Time: 13:46:29



Picture parameters:

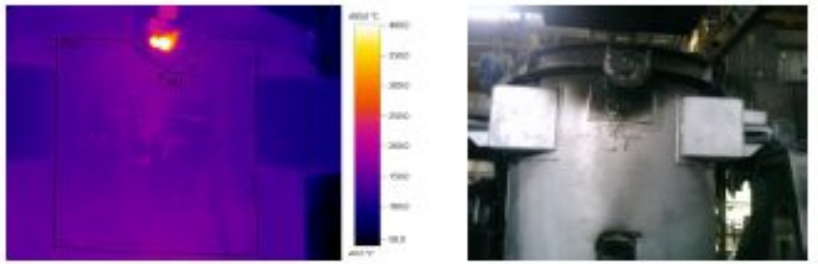
Emissivity:	0.96
Refl. temp. [°C]:	20.0

Picture markings:

Measurement Objects	Temp. [°C]	Emiss.	Refl. temp. [°C]	Remarks
Measure point 1	191.1	0.96	20.0	-
Average Area 1	159.4	0.96	20.0	-

After Cycle Time: 80 mins

File: IR000945 Pouring spout Front side.BMT
Date: 07-10-2017
lens type: 35° x 26°
lens serial no.:
Time: 14:55:06



Picture parameters:

Emissivity:	0.96
Refl. temp. [°C]:	20.0

Picture markings:

Measurement Objects	Temp. [°C]	Emiss.	Refl. temp. [°C]	Remarks
Measure point 1	125.2	0.96	20.0	-
Average Area 1	108.2	0.96	20.0	-

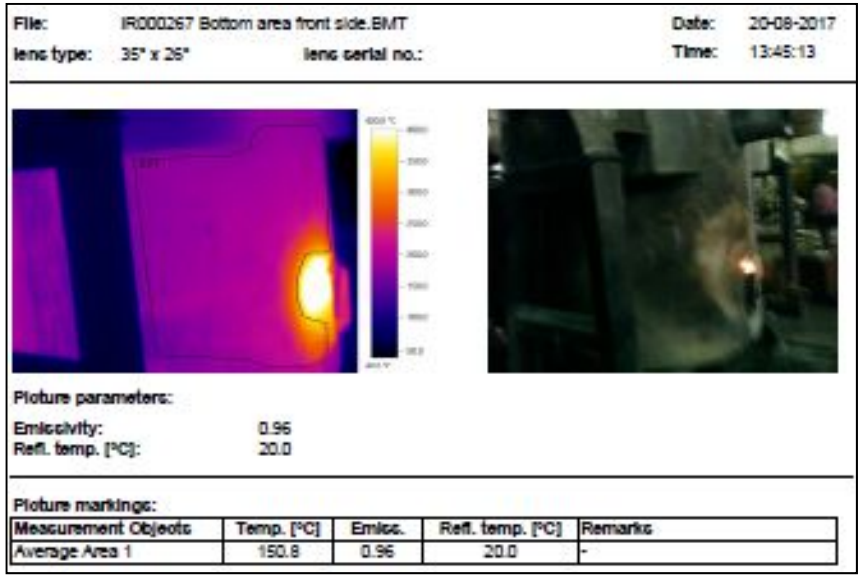
After Thermal coating application Furnace Surface / skin Reduction in temperature

Location	Before Coating	After Coating	**Reduction in Temperature**
Pouring spout Front side	159.4°C	108.2°C	**51.2°C**

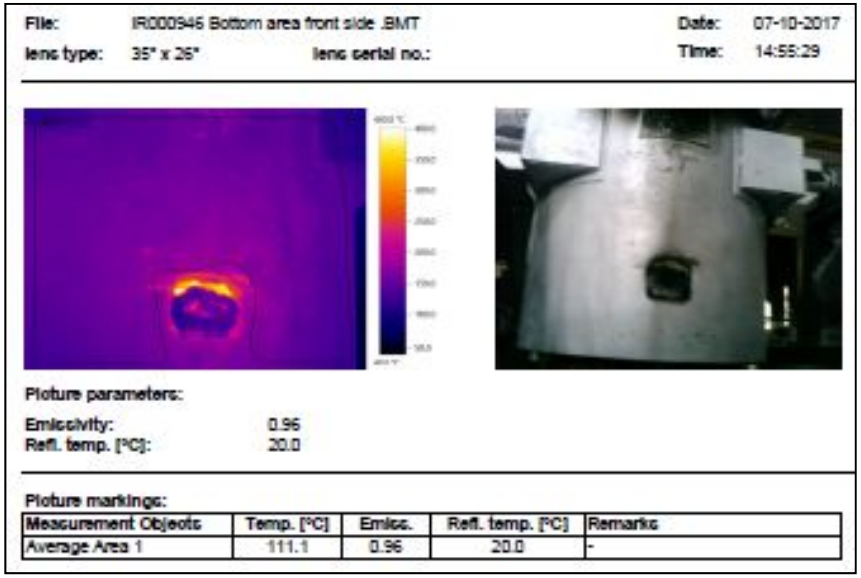
Per heat melting time (cycle time) reduced by 10 minutes.
Completed 4 Melting furnaces in last five months.
Operating with 7 furnaces, earlier 8 furnaces was in operation.
Energy Cost Saving upto 9% with ROI less than 2 months.

MF8: Bottom area front side

Before



After

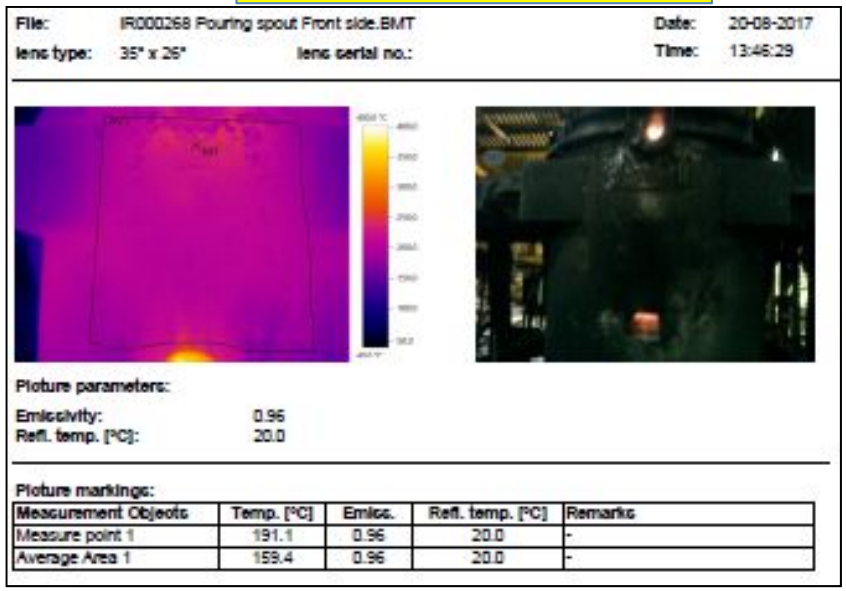


After Thermal coating application Furnace Surface / skin
Reduction in temperature

Location	Before Coating	After Coating	**Reduction in Temperature**
Bottom area front side	150.8°C	111.1°C	**39.7°C**

MF8: Pouring spout Front side

Before


File: IR000268 Pouring spout Front side.BMT
Date: 20-08-2017
lens type: 35° x 25°
lens serial no.:
Time: 13:46:29

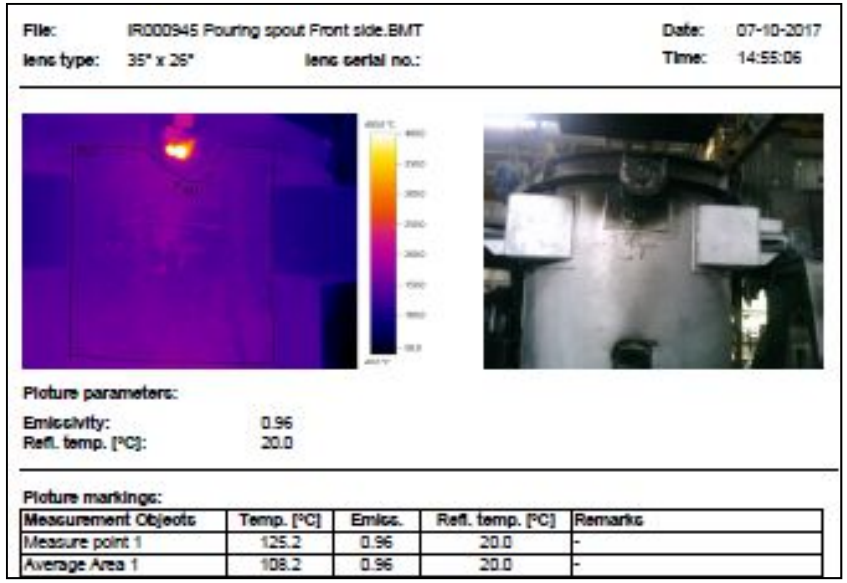
Picture parameters:

Emissivity: 0.96
Refl. temp. [°C]: 20.0

Picture markings:

Measurement Objects	Temp. [°C]	Emiss.	Refl. temp. [°C]	Remarks
Measure point 1	191.1	0.96	20.0	-
Average Area 1	159.4	0.96	20.0	-

After


File: IR000945 Pouring spout Front side.BMT
Date: 07-10-2017
lens type: 35° x 25°
lens serial no.:
Time: 14:55:06

Picture parameters:

Emissivity: 0.96
Refl. temp. [°C]: 20.0

Picture markings:

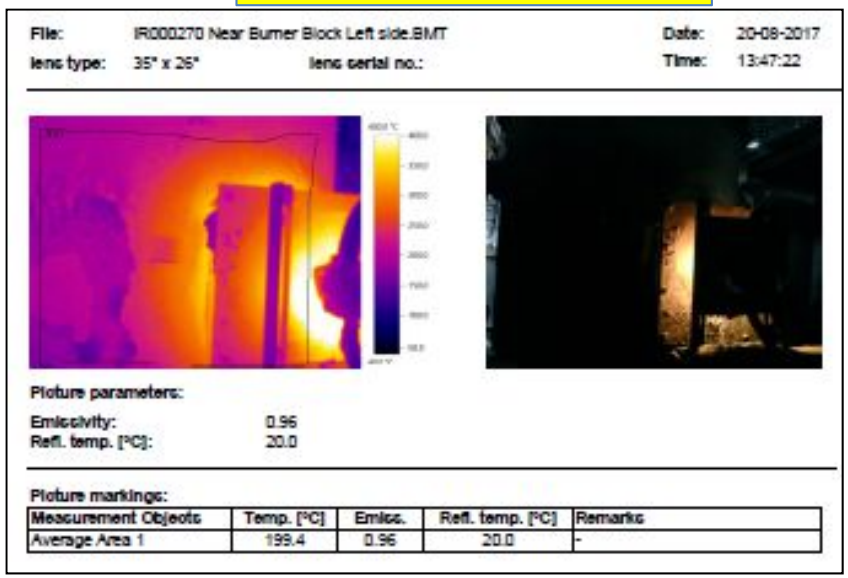
Measurement Objects	Temp. [°C]	Emiss.	Refl. temp. [°C]	Remarks
Measure point 1	125.2	0.96	20.0	-
Average Area 1	108.2	0.96	20.0	-

After Thermal coating application Furnace Surface / skin
Reduction in temperature

Location	Before Coating	After Coating	Reduction in Temperature
Pouring spout Front side	159.4°C	108.2°C	51.2°C

MF8: Near Burner Block Left side

Before


File: IR000270 Near Burner Block Left side.BMT
Date: 20-09-2017
lens type: 35° x 25°
lens serial no.:
Time: 13:47:22

Picture parameters:

Emissivity: 0.96
Refl. temp. [°C]: 20.0

Picture markings:

Measurement Objects	Temp. [°C]	Emiss.	Refl. temp. [°C]	Remarks
Average Area 1	199.4	0.96	20.0	-

After


File: IR000949 Near Burner Block Left side.BMT
Date: 07-10-2017
lens type: 35° x 25°
lens serial no.:
Time: 14:56:38

Picture parameters:

Emissivity: 0.96
Refl. temp. [°C]: 20.0

Picture markings:

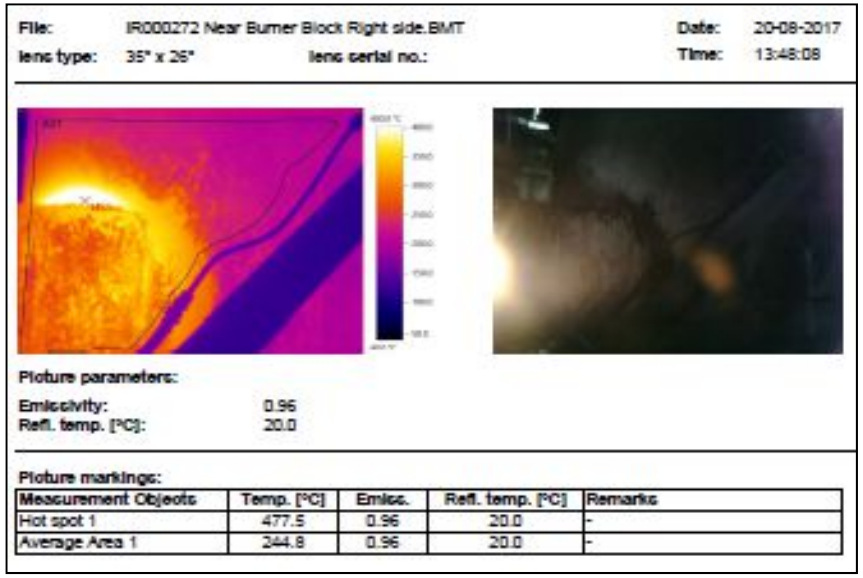
Measurement Objects	Temp. [°C]	Emiss.	Refl. temp. [°C]	Remarks
Average Area 1	139.5	0.96	20.0	-

After Thermal coating application Furnace Surface / skin
Reduction in temperature

Location	Before Coating	After Coating	Reduction in Temperature
Near Burner Block Left side	199.4°C	139.5°C	59.9°C

MF8: Near Burner Block Right side

Before



File: IR000272 Near Burner Block Right side.BMT
Date: 20-09-2017
lens type: 35° x 26°
lens serial no.:
Time: 13:48:08

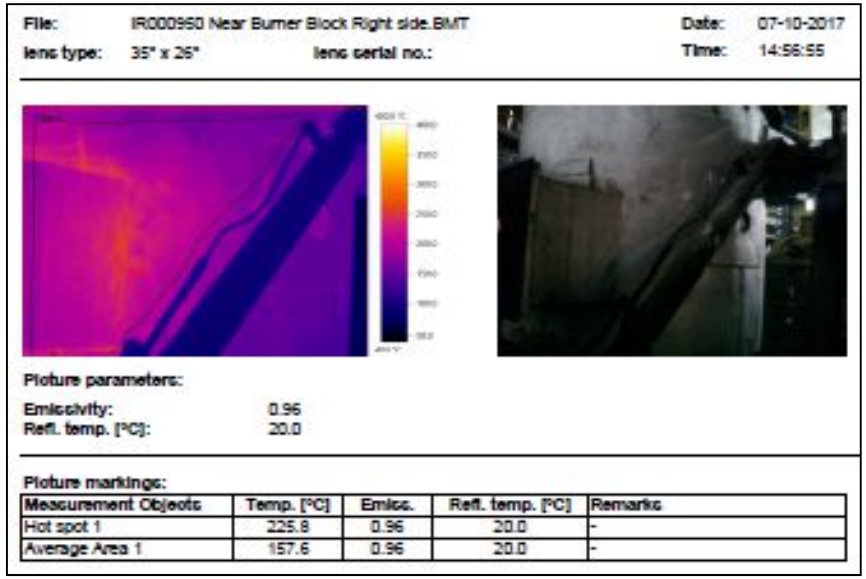
Picture parameters:

Emissivity:	0.96
Refl. temp. [°C]:	20.0

Picture markings:

Measurement Objects	Temp. [°C]	Emiss.	Refl. temp. [°C]	Remarks
Hot spot 1	477.5	0.96	20.0	-
Average Area 1	244.8	0.96	20.0	-

After



File: IR000950 Near Burner Block Right side.BMT
Date: 07-10-2017
lens type: 35° x 26°
lens serial no.:
Time: 14:56:55

Picture parameters:

Emissivity:	0.96
Refl. temp. [°C]:	20.0

Picture markings:

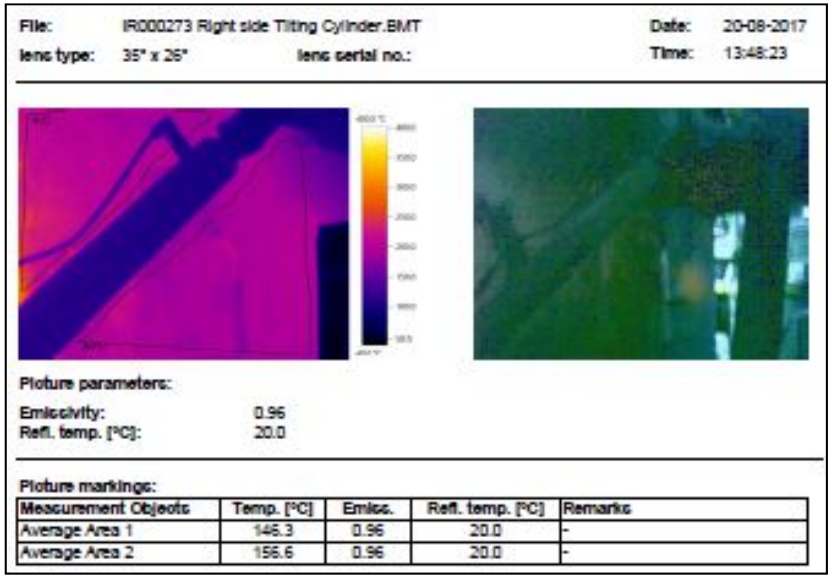
Measurement Objects	Temp. [°C]	Emiss.	Refl. temp. [°C]	Remarks
Hot spot 1	225.8	0.96	20.0	-
Average Area 1	157.6	0.96	20.0	-

After Thermal coating application Furnace Surface / skin
Reduction in temperature

Location	Before Coating	After Coating	Reduction in Temperature
Near Burner Block Right side	244.8°C	157.8°C	87.0°C

MF8: Right side Tilting Cylinder

Before



File: IR000273 Right side Tilting Cylinder.IMT
Date: 20-08-2017
lens type: 35° x 26°
lens serial no.:
Time: 13:48:23

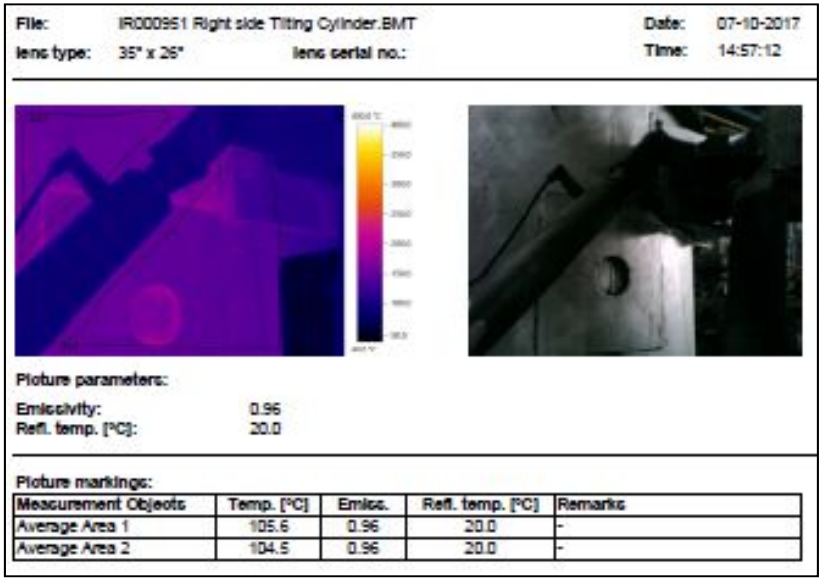
Picture parameters:

Emissivity: 0.96
Refl. temp. [°C]: 20.0

Picture markings:

Measurement Objects	Temp. [°C]	Emiss.	Refl. temp. [°C]	Remarks
Average Area 1	146.3	0.96	20.0	-
Average Area 2	156.6	0.96	20.0	-

After



File: IR000951 Right side Tilting Cylinder.IMT
Date: 07-10-2017
lens type: 35° x 26°
lens serial no.:
Time: 14:57:12

Picture parameters:

Emissivity: 0.96
Refl. temp. [°C]: 20.0

Picture markings:

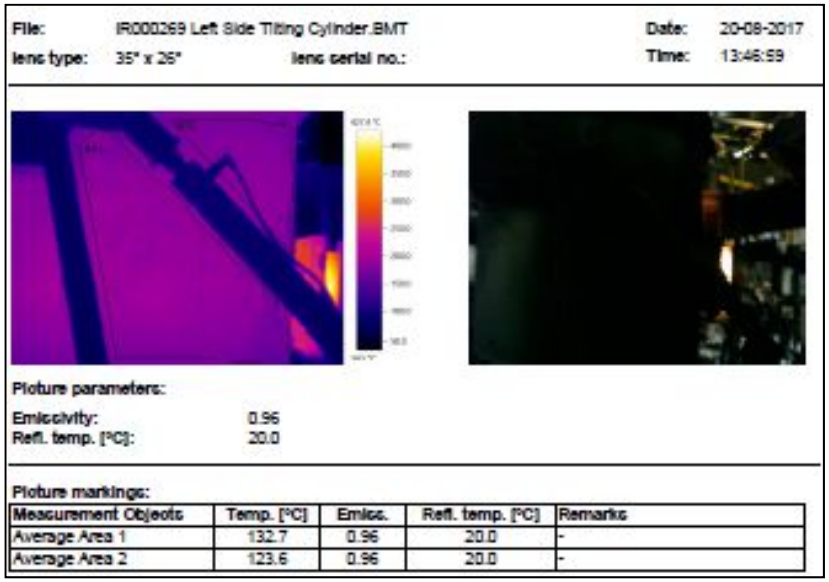
Measurement Objects	Temp. [°C]	Emiss.	Refl. temp. [°C]	Remarks
Average Area 1	105.6	0.96	20.0	-
Average Area 2	104.5	0.96	20.0	-

After Thermal coating application Furnace Surface / skin Reduction in temperature

Location	Before Coating	After Coating	Reduction in Temperature
Right side Tilting Cylinder	156.6°C	104.5°C	52.1°C

MF8: Left Side Tilting Cylinder

Before



File: IR000269 Left Side Tilting Cylinder.IMT
Date: 20-08-2017
lens type: 35° x 26°
lens serial no.:
Time: 13:46:59

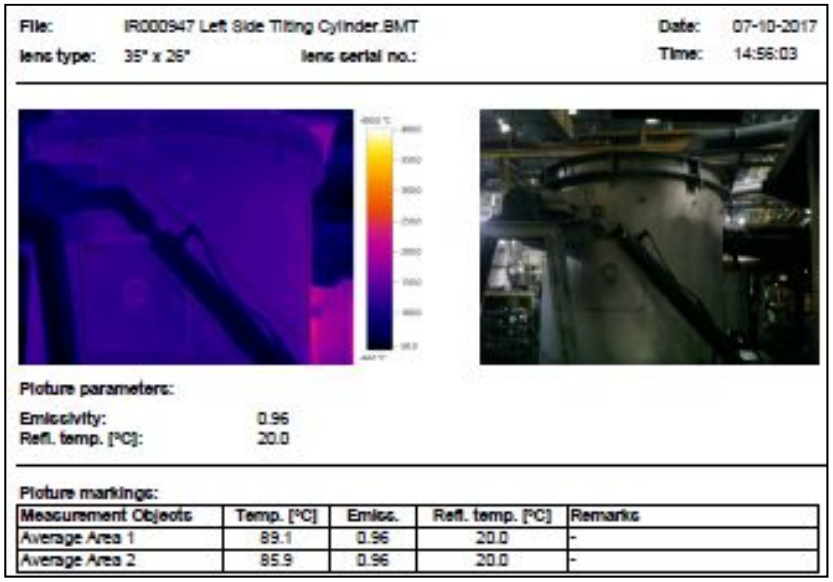
Picture parameters:

Emissivity:	0.96
Refl. temp. [°C]:	20.0

Picture markings:

Measurement Objects	Temp. [°C]	Emiss.	Refl. temp. [°C]	Remarks
Average Area 1	132.7	0.96	20.0	-
Average Area 2	123.6	0.96	20.0	-

After



File: IR000947 Left Side Tilting Cylinder.IMT
Date: 07-10-2017
lens type: 35° x 26°
lens serial no.:
Time: 14:56:03

Picture parameters:

Emissivity:	0.96
Refl. temp. [°C]:	20.0

Picture markings:

Measurement Objects	Temp. [°C]	Emiss.	Refl. temp. [°C]	Remarks
Average Area 1	89.1	0.96	20.0	-
Average Area 2	85.9	0.96	20.0	-

After Thermal coating application Furnace Surface / skin Reduction in temperature

Location	Before Coating	After Coating	Reduction in Temperature
Left Side Tilting Cylinder	128.2°C	87.4°C	40.8°C

Summary for Surface Temperature Reduction

Summary for Surface Temperature Reduction after Thermal Coating (Values in °C)				
Sr. No.	Loaction	Before 20.08.17	After 07.10.17	Temperature Reduced
1	Bottom area front side	150.8	111.1	39.7
2	Pouring spout Front side	159.4	108.2	51.2
3	Near Burner Block Left side	199.4	139.5	59.9
4	Near Burner Block Right side	244.8	157.8	87.0
5	Right side Tilting Cylinder	156.6	104.5	52.1
6	Left Side Tilting Cylinder	128.2	87.4	40.8

Thanks & What can we do for you!