



Specialists in Thermal Applications

www.furnxpert.com

Continuous Reheat Process Application determines optimum set points in continuous Pusher furnaces. The software also calculates Zone Inputs, Fuel Consumption, Furnace Efficiency along Charge Temperature, Scale, & Decarburization during heating cycle.

The screenshot displays the HeatXpert Continuous software interface, which is divided into several functional windows:

- Furnace Configuration:** This window is split into three tabs:
 - Furnace Details:** Includes 'Furnace Parameter' (Furnace Type: Pusher), 'Heating Type' (Top and Bot. Fired), 'Wrap Around Option' (No Wrap), 'Charge Rolls' (# of Rolls: 10, Diameter: 0.3 m, Width: 0.6 m, Loss Factor: 0.2), and 'Discharge Rolls' (# of Rolls: 0, Diameter: 0 m, Width: 0 m).
 - Wall & Skid Details:** (Empty)
 - Fuel & Burner:** (Empty)
- Zone Details:** A table showing furnace zones:

Zone	Top Zone	Top Dist. (m)	Bot. Zone	Bot. Dist. (m)
1	1	3.82	1	3.82
2	2	9	2	9
3	3	14		
- Heat Balance:** A Sankey Diagram showing energy flows:
 - Gross Heat Input (G): 29,968,290.00 J/sec
 - Net Heat Input (N): 28,564,464.00 J/sec
 - Available Input (A): 25,600,430.00 J/sec
 - Net Heat to Air: 6,697,839.50 J/sec
 - FLUE LOSS: 10,176,671.00 J/sec
 - Combustion Air Temp: 797 Deg C
 - RECUOPERATOR: A dashed box highlights the heat recovery section.
- Temperature Curve Inside Furnace:** A graph titled 'COMPUTED TEMPERATURE PROFILE' showing temperature (0 to 1400) vs. distance (0 to 7). The y-axis is labeled 'Temperature' and 'Degree C'. The x-axis is labeled 'Distance in m'. Multiple colored lines represent different temperature profiles (Zone Top, Zone Bot, Charge Top, Charge Center, Charge Bot).
- Charge Details:** A window for 'Charge Shape & Dimension' showing:
 - Shape: Billet
 - Diameter (D): cm
 - Thickness (H): 13 cm
 - Length (L): 10 m
 - Width (W): 13 cm
 It includes a diagram of a rectangular charge with dimensions W, H, and L, and a 3D perspective view.
- Other Details:**
 - Grade: 1008 GRADE
 - Charge Temperature: 250 Deg C
 - View Factor Top: 0.8
 - View Factor Bot: 0.5
 - Target Temperature: 1151 Deg C
 - Target delta T: 10 Deg C

- Builds Furnaces data with Zone/Furnace Dimensions, Furnace Insulation, Burner Type, Fuel etc.
- Creates Charges from basic shapes (Billets, Ingots, Slabs, Rounds) by entering dimensions and material properties (provided with the software).
- Creates Zone Setpoints from Push/Walk Rate and production rate.**
- Property Data: Comes with a entire database of Steel Grades, Fuel types, and Refractory materials.
- Provides capability to create new Steel Grades, Refractory materials and fuel types
- Results include
 - Charge Temperature profile during reheating and at exit – Can be ported to Mill Program
 - 2 D skid marks for slab heating furnaces
 - Scaling/Decarburization depth
 - Zone wise thermal loading
 - Zone wise fuel and air inputs
 - Fuel Consumption and Furnace efficiency
- Calculates heat to part, refractory loss, heat to gases, and heat and energy/power consumed in different zones, Heat loss through the flue, fuel consumption and furnace efficiency. The results are displayed in a Sankey diagram.
- Results from each calculation can be displayed in report format. The results can be directly printed, saved as a PDF format or exported to an Excel spread Sheet.

The screenshot shows the HeatXpert software interface. The title bar reads "FurnXpert : Continuous Reheat - Process". The menu bar includes "File", "View", "Charge", "Profile Option", and "Process". The toolbar contains icons for file operations and a button labeled "AU". The main window features a vertical sidebar on the left with the following buttons: "Furnace", "Charge", "Place Charge", "Settings", "Details", "Heat Audit", "No Load", "Dashboard", "Reports", "Help", and "Exit".

Teal callout boxes with white text and arrows point to the following functions:

- CONFIGURE NEW FURNACES** (points to the "Furnace" button)
- CREATE PARTS/CHARGES** (points to the "Charge" button)
- PLACE CHARGES ON THE FURNACE** (points to the "Place Charge" button)
- DETERMINE SETTINGS** (points to the "Settings" button)
- DETAILS** (points to the "Details" button)
- HEAT AUDIT & ZONE INPUT & FUEL CONSUMPTION** (points to the "Heat Audit" button)
- DASHBOARD** (points to the "Dashboard" button)
- CREATE AND PRINT REPORTS** (points to the "Reports" button)
- HELP** (points to the "Help" button)

UNIT SYSTEM: Default

FURNACE CREATED BY: None

CONTRACT NO: None

JOB NAME: None

Enter Furnace Data

FurnXpert : Continuous Reheat - Process

File View Charge Profile Option Process Reports Tools Properties Analysis Options Help

Furnace Configuration

Furnace Details

Furnace Parameter

Furnace Type: Walking Hearth

Width: 7.18 m

Length: 26.38 m

Zone Details

of Zones: 4

Zone	Top Dist. m	Zone Capacity MMBtu/Hr
PH	9.03	
1	13.71	4.994
2	19.9	6.658
3	26.38	4.756

Charge Rolls

Charge Rolls

of Rolls: 7

Diameter: 0.3 m

Width: 0.47 m

Loss Factor charge (0.1 - 1.0): 1

Discharge Rolls

Discharge Rolls

of Rolls: 7

Diameter: 0.28 m

Width: 0.42 m

Loss Factor discharge (0.1 - 1.0): 1

Other Specification

Charge Door Area: 0.11 Sq. m

Discharge Door Area: 0.13 Sq. m

Zone Screen Input: 0 MKCal/Hr

Misc. Factor Input Q Misc. factor

Save As Ok Cancel Apply

UNIT SYSTEM: MKS FURNACE CREATED BY: TK CONTRACT NO: TEst JOB NAME: TEst

INPUT ALL THE FURNACE DETAILS

- Furnace Type & Dimension
- Charge and Discharge Roll Info
- Zone Details
- Wall & Skid information
- Fuel Specification
- Burner Type

Enter Refractory Data

INPUT WALL SPECIFICATION

- Refractory Factors (Zone Wise)
- Wall Area & Insulation details

FurnXpert : Continuous Reheat - Process

File View Charge Profile Option Process Reports Tools Properties Analysis Options Help

AU

Furnace Configuration

Furnace Details | **Wall & Skid Details** | **Fuel & Burner**

Refractory Factors

Single
 Multi

Side Walls: Top Wall Area: Sq.m / m
Roof: Slot area: Sq.m / m
Hearth:

Insulation

Layers: -1- cm

Walls	#	FB	cm
Walls	<input type="text" value="3"/>	FB	<input type="text" value="20"/>
Roof	<input type="text" value="2"/>	IB	<input type="text" value="20"/>
Hearth	<input type="text" value="1"/>	IB	<input type="text" value="54"/>

Skid Insulation

L1:
L2:

Number of Layers:

Layer	Material	Thickness	cm
Layer 1	Steel	<input type="text" value="3"/>	cm
Layer 2	Insulating Brick	<input type="text" value="4"/>	cm
Layer 3		<input type="text"/>	cm
Layer 4		<input type="text"/>	cm

UNIT SYSTEM: MKS

FURNACE CREATED BY: TK

CONTRACT NO: TEst

JOB NAME: TEst

Enter Fuel & Burner Data

FurnXpert : Continuous Reheat - Process

File View Charge Profile Option Process Reports Tools Properties Analysis Options Help

AU

Furnace Configuration

Furnace Details

Combustion Details

Single Input Multi Zone Input

Fuel Specification

Type of Fuel
NATURAL GAS - 8897 Gross kcal/cu.m

Xs Air (%)

Comb. Air Temp. Deg C

Fuel Temp. Deg C

Type of Burner

Regenerative Conventional

Flue Extraction (%)

Fuel Properties

NATURAL GAS - 8897 Gross kcal/cu.m

Type of Fuel

Gaseous Liquid

Heating Value (in KCal / Cu. m)

HHV LHV

Ratio (in Cu. m / Cu. m)

Air/Fuel Flue/Fuel

NATURAL GAS - 8897 Gross kcal/cu.m
NATURAL GAS - 8897 Gross kcal/cu.m
COKE OVEN GAS - ARMCO MIDD. WKS.
PRODUCER GAS - LURGI COMMERCIAL
NO.2 OR DIESEL - 9920 net kcal/kg
NO.6 OR BUNKER C OIL - 9600 net kcal/kg
COREX GAS - ISCOR S.AFRICA
CSH PRODUCER GAS - LOW HEAT
tempNO.6 - SAME AS FUEL NUMBER 5

Save As Ok Cancel Apply

FUEL & BURNER DATA – Zone wise input available.

- Type of Fuel
- Percent of Excess Air
- Combustion Air Temperature
- Fuel Temperature
- Type of Burner (Conventional/Regenerative)

Fuel Type to use.

Can select between conventional and Regenerative Burner

List of Fuel

Charge Creation

FurnXpert : Continuous Reheat - Process

File View Charge Profile Option Process Reports Tools Prop

Create charges from list of shapes.
 Created charges can be saved on file to be used later

Select Charge Shape

Input Charge Dimensions

Part Drawing

Part Drawing 3D

Select Grades from drop down menu

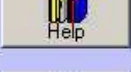
Enter Charge Temp, Target Temp and Del T

Select Grades from drop down menu

UNIT SYSTEM: MKS FURNACE CREATED BY: HKN CONTRACT NO: 1234 JOB NAME: Sokmen

Charge Placement

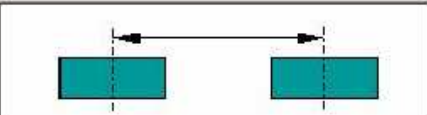
FurnXpert : Continuous Reheat - Process
File View Charge Profile Option Process Reports Tools Properties Analysis Options Help



Enter Center to Center Distance

Placement of Charge

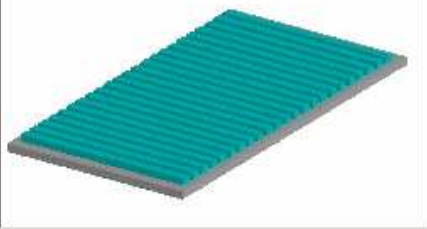
Center to Center Spacing cm



Alignment

Across Along

of charges placed across the furnace



Cancel Default Ok

Single User License

UNIT SYSTEM: MKS

FURNACE CREATED BY: TK

CONTRACT NO: TEst

JOB NAME: TEst



Setting Determination

Settings

Charge Shape & Dimension

Shape: Billet

Diameter [D]: cm

Thickness [H]: 20 cm

Length [L]: 6 m

Width [W]: 20 cm

Other Details

Prod. Rate: 35 MTon/Hr RT: 97 min

Offset: 100 Deg C

Zone Details

Zone #	Offset Factor	Min. Deg C	Max. Deg C	Calc Deg C
PH				
1	0.6	1140	1260	1141
2	0.6	1140	1260	1176
	0.3	1170	1230	1230

Charge Details

Grade: 1008 GRADE

Charge Temp.: 21 Deg C

Target Temp.: 1200 Deg C

Target Del T: 30 Deg C

COMPUTED PROFILE

TEMPERATURE vs. Distance

Discharge Temp.: 1208 Deg C

Save data to be shown on Dashboard screen

Calculate SP Calculate PR

Save Close

Provide Production Rate

Temperature Offset

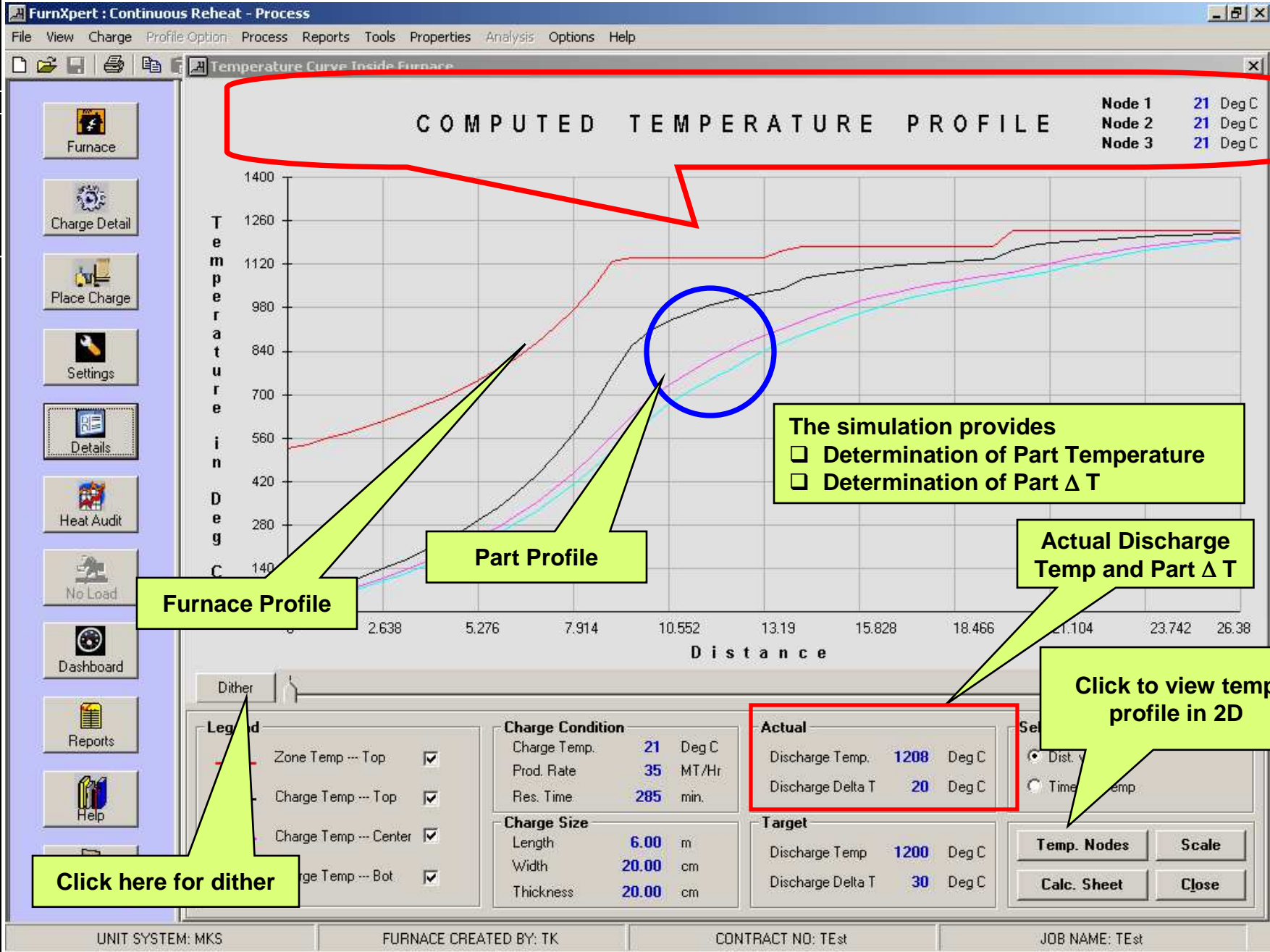
Offset Factor

Calculated Setpoint Temperatures

Furnace and Charge Profile with calculated Setpoints

Save data to be shown on Dashboard screen

Simulated Results



2 D Grid Temp and Dither

Nodal Temperature Distribution

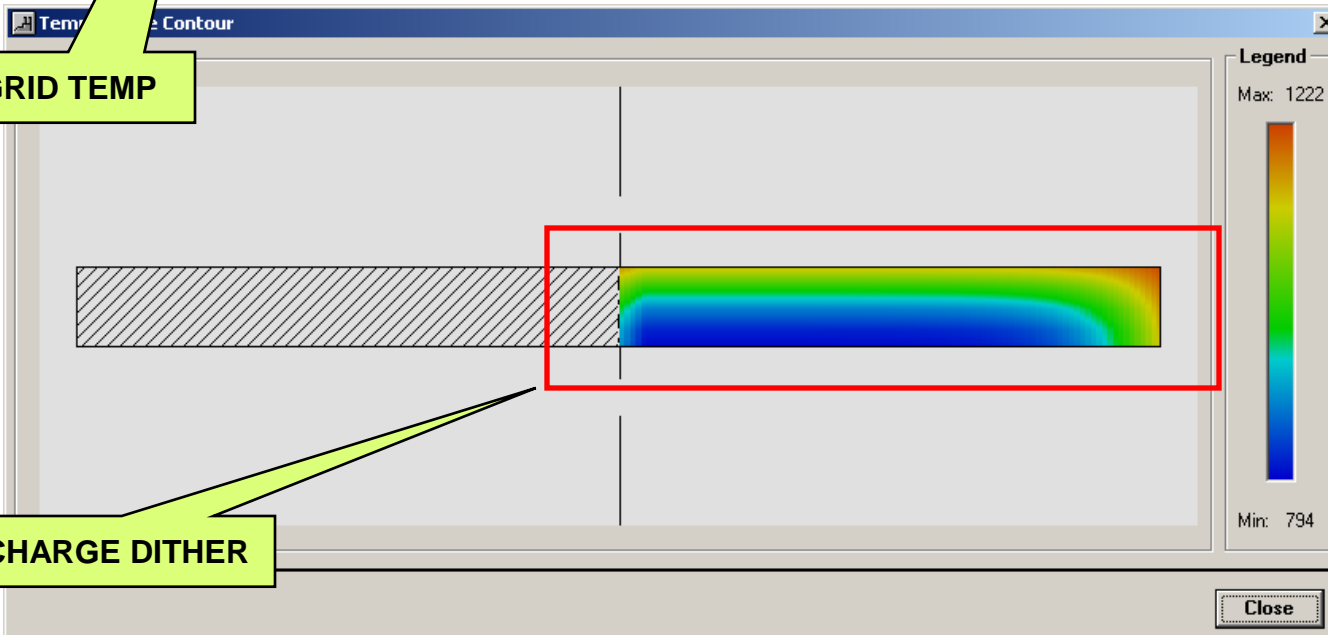
1153	1119	1119	1119	1119	1119	1119	1119	1119	1119	1119	1119	1119	1120	1120	1121	1123	1125	1129	1136	1145	1157	1176	1198	1222	
1047	985	985	985	985	985	985	985	985	986	986	986	986	987	988	990	993	997	1005	1017	1037	1066	1105	1153	1203	
963	881	881	881	881	881	881	881	881	881	881	882	882	883	885	887	891	897	908	925	951	990	1043	1113	1187	
910	818	818	818	818	818	818	818	818	818	818	818	819	820	822	825	829	837	848	867	897	941	1004	1085	1175	
892	794	794	794	794	794	794	794	794	794	795	795	795	796	797	799	802	807	815	827	847	878	924	989	1075	1171

Temperatures
 Nodes
 Demarcation

Distance : 7.32 m
Time : 141 min.
Furnace Temp (Top) : 1239 Deg C
Furnace Temp (Bottom) :

Wear Bar Temperature
Left : 0 Deg C
Right : 0 Deg C

Selected Nodes
 Node 1 : 1
 Node 2 : 51
 Node 3 : 101

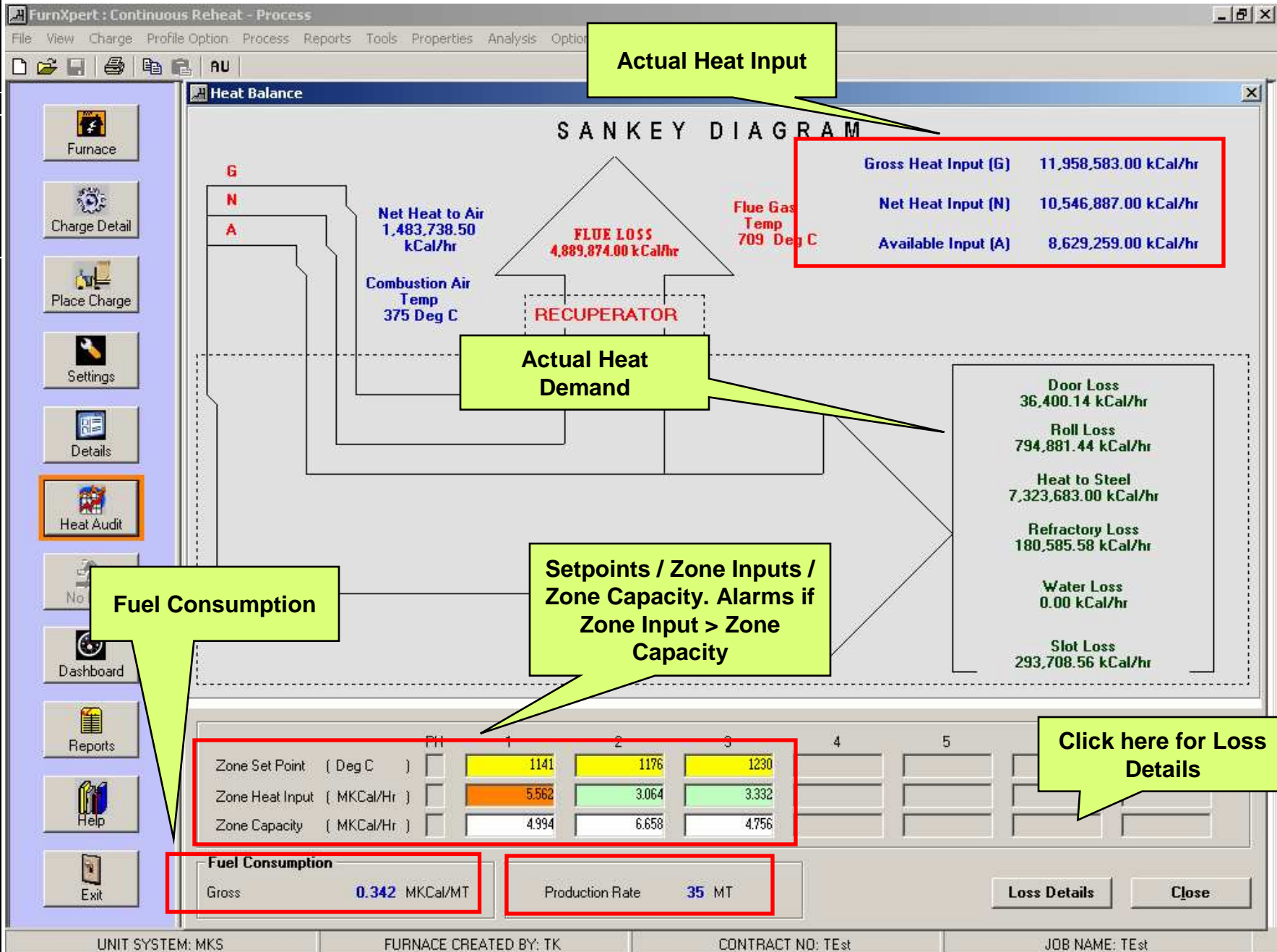


Decarburization & Scale Calculation

MATERIAL TEMPERATURE				KCL/Kg	DECARB [MM]	SCALE [MM]	TIME min
TOP	CNTR	BOT	AVG				
38.	38.	38.	38.	0.	0.000	0.000	0.0
235.	107.	72.	126.	10.	0.000	0.000	11.7
378.	204.	155.	229.	23.	0.000	0.000	23.4
542.	314.	249.	347.	39.	0.000	0.000	35.1
724.	433.	355.	477.	59.	0.000	0.006	46.8
933.	553.	460.	623.	83.	0.001	0.040	58.5
1027.	658.	557.	721.	103.	0.005	0.111	70.3
1074.	735.	638.	796.	119.	0.008	0.187	82.0
1101.	799.	701.	838.	131.	0.012	0.261	93.7
1118.	850.	750.	874.	141.	0.015	0.332	105.4
1131.	893.	802.	930.	150.	0.018	0.399	117.1
1143.	930.	850.	973.	157.	0.021	0.464	128.8
1153.	963.	892.	1006.	164.	0.023	0.526	140.5
1162.	992.	927.	1032.	170.	0.026	0.587	152.2
1170.	1017.	959.	1056.	175.	0.029	0.648	163.9
1158.	1040.	988.	1074.	179.	0.031	0.705	175.6
1155.	1056.	1013.	1087.	182.	0.033	0.751	187.3
1159.	1069.	1033.	1097.	185.	0.035	0.795	199.1
1163.	1082.	1050.	1107.	187.	0.037	0.838	210.8
1167.	1094.	1065.	1115.	190.	0.039	0.881	222.5
1170.	1105.	1079.	1119.	192.	0.041	0.923	234.2
1173.	1115.	1091.	1121.	194.	0.043	0.965	245.9
1177.	1125.	1103.	1126.	196.	0.044	1.006	257.6
1179.	1134.	1115.	1134.	197.	0.046	1.046	269.3
1182.	1143.	1126.	1142.	198.	0.048	1.087	281.0
1184.	1151.	1137.	1149.	200.	0.050	1.126	292.7

Decarb & Scale

Sankey Diagram



Heat Audit – Loss Details

FurnXpert : Continuous Reheat - Process

File View Charge Profile Option Process Reports Tools Properties Analysis Options Help

Heat Balance

SANKEY DIAGRAM

Net Heat to Air: 202,509.69 kCal/hr

FLUE LOSS: 4,061,241.75 kCal/hr

Combustion Air

Gross Heat Input (G)	7,612,782.00 kCal/hr
Net Heat Input (N)	6,714,102.00 kCal/hr
Available Input (A)	3,760,257.25 kCal/hr

Heat Audit

HEAT AUDIT

Top Zones			Bottom Zones						
Zone #	Heat to Steel MKcal/Hr	Ref. Heat Loss MKcal/Hr	Total MKcal/Hr	Zone #	Heat to Steel MKcal/Hr	Ref. Heat Loss MKcal/Hr	Water Loss MKcal/Hr	Slot Loss MKcal/Hr	Total MKcal/Hr
PH	1.209	0.084	1.293						
1	1.458	0.211	1.669						
2	0.318	0.212	0.530						
Total	2.985	0.507	3.492	Total					

Zone Wise Heat Demand

Zone Input (kCal/hr)															
#	PH	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Top		5241	2371												
Bot															

Fuel Consumption		Flue	
Gross	0.508 MKCal/MT	Flue Loss Latent	898,679.88 kCal/hr
Net	0.448 MKCal/MT	Flue Loss Sensible	3,162,562.00 kCal/hr
		Flue Gas Temp	977 Deg C

UNIT SYSTEM: MKS FURNACE CREATED BY: HKN CONTRACT NO: 1234 JOB NAME: HKN

Dashboard Report



Click to export data to Excel

Click to make PDF File

Click to print the report

Heat :	MKCal/Hr.
Temperature :	Deg C
Dimension :	cm
Time :	min
Fuel Consumption :	MKCal/MT
Production Rate :	MT

Diameter[D]	-	cm
Thickness[H]	20	cm
Length[L]	6	m
Width[W]	20	cm
Charge Temp	21	Deg C
Target Temp	1200	Deg C
Target Del T	30	Deg C

D A S H B O A R D

Prod. Rate	Z1 SP HI	Z2 SP HI	Z3 SP HI	Z4 SP HI	Z5 SP HI	Z6 SP HI	Z7 SP HI	Heat To Steel	Fuel Cons	Fue Temp	Res. Time	Dis. Temp	Dis. Del T
35	1141 5.562	1176 3.064	1230 3.332	-	-	-	-	7.324	0.342	709	285	1208	20
35	1051 4.357	1213 4.042	1230 3.414	-	-	-	-	7.324	0.338	700	285	1208	20
37	1051 4.464	1241 4.603	1230 3.416	-	-	-	-	7.742	0.337	710	269	1208	20
39	1068 4.801	1260 4.986	1230 3.408	-	-	-	-	8.159	0.338	722	256	1208	20
41	1071 5.001	1260 5.207	1230 3.609	-	-	-	-	8.542	0.337	731	243	1202	25
41	1051 4.649	1294 5.789	1230 3.415	-	-	-	-	8.579	0.338	729	243	1208	20
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-

Setpoints

Zone Input

Compiles all the results with Setpoints, Zone Input, Fuel Consumption, Residence Time





Click to make PDF File

Click to print the report

Profile

- 2 pages of reports are printed
- Reports can be directly printed
- PDF file of the report can be made
- Shows date and time stamp
- Provides all the inputs and outputs

Heat : MKCal/Hr. Dimension : cm
Tempera : Deg C Fuel Consumption : MKCal/M

Furnace Created By : HKN
Contract : 1234
Job : Sokmen

Furnace Specifications

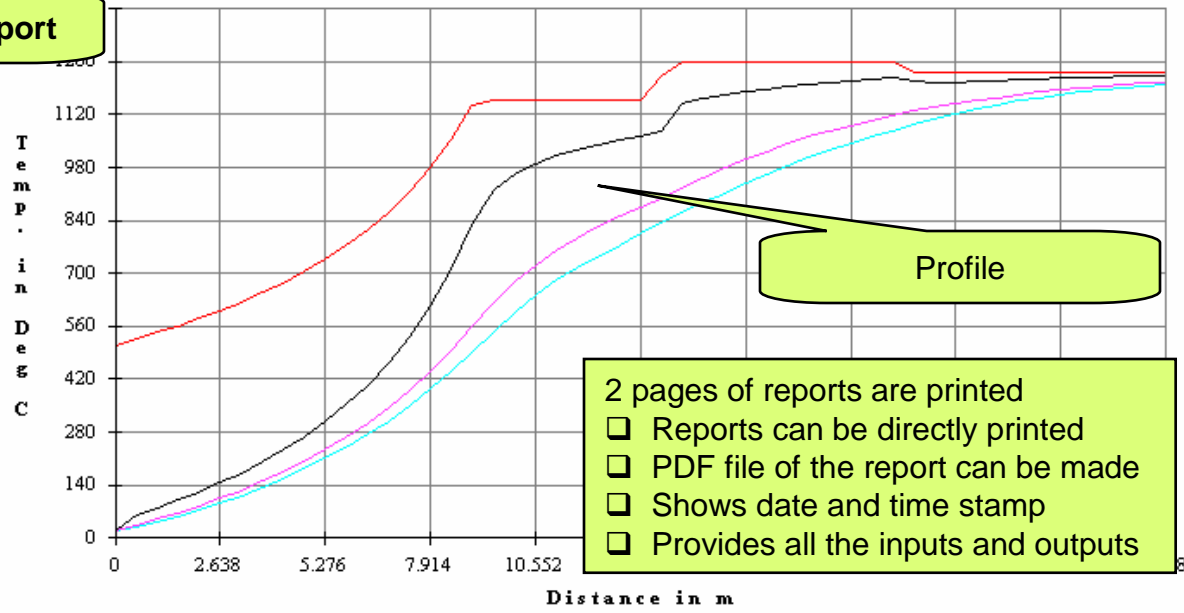
Furnace Type :
Heating Type : To
Furnace Length : 38 m
Furnace Wid
Charge Door
Discharge Door Area : 0.13 Sq. m
Top Wall Area : 1.5 Sq. m / m
Bottom Wall Area : 0 Sq. m / m
Production Rate : 35 MTon / Hr

Charge Specifications

Diameter[D] : - cm
Thickness[H] : 20 cm
Length[L] : 6 m
Width[W] : 20 cm
Charge Temp : 21 Deg C
Target Temp : 1200 Deg C
Target Del T : 30 Deg C

— Charge Temp - Node 1
— Charge Temp - Node 2
— Charge Temp - Node 3

— Zone Temp - Top



Discharge Temp

Avg. Temp.: 1209
Delta T: 13

Fuel & Comb. Spec.

Fuel : NATURAL GAS - 8897 Gross kcal/cu.m
Comb. Air Temp.: 375
Fuel Temp.: 20
Excess Air : 10%

Zone SP

1	2	3	4	5	6	7
1157 ^o C	1260 ^o C	1230 ^o C	-	-	-	-

Click to print the report

Reports [Print Icon] [Close]

Heat : MKCal/Hr. Dimension : Special
 Temperature : Deg C Fuel Consumption : MKCal/MT

R E P O R T

Furnace Created By : HKN
 Contract : 1234
 Job : Sokmen

Zone Set Point	
Zone	Zone SP
PH	-
1	1157
2	1260
3	1230

Setpoints

Zone Capacity	
Zone	Zone Capacity
PH	-
1	10
2	10
3	5
Total	25.000

Zone Capacity

Zone Heat Input	
Zone	Heat Input
PH	-
1	5.185
2	3.588
3	2.750
Total	11.523

Zone Inputs

Zone Available Heat				
Zone	Steel	Wall Loss	Total	
PH	2.894	0.038	2.932	
1	2.388	0.037	2.425	
2	1.630	0.055	1.685	
3	0.410	0.056	0.466	
Total	7.322	0.186	7.508	

Fuel Consumption

Fuel Consumption	
Flue Gas Temp.:	695
Tot.Fuel Input-Gross:	11.523
Tot.Fuel Input-Net:	10.163
Gross Fuel Consump.:	0.329
Net Fuel Consump.:	0.290

Available Heat	
Heat to Steel:	7.322
Heat to Wall:	0.186
Water Loss:	0.000
Slot Loss:	0.000
Door Loss:	0.036
Roll Loss:	0.806
Total Heat Available:	8.350

Flue Gas Loss	
Recuperated Heat:	1.430
Flue Gas Latent:	1.360
Flue Gas Sensible:	3.282
Total Flue Gas Loss:	4.643

Data creation - Material

Material Data

Material Name: 1008 GRADE

Units: English Unit Metric Unit

Density: 7851.597 Kg/cu.m % Carbon: 0.08

Temperature: Deg C Sp. Heat: J/gm-K

Emissivity: 0.85

Material Data

Material Name: 1008 GRADE

Density: 7851.597 Kg/cu.m

Emissivity: 0.85

Units: English Unit Metric Unit

Temperature: Deg C Sp. Heat: J/gm-K Conductivity: Watt/m-Deg C Density: Kg/cu.m

Conductivity

Temperature Deg C	Conductivity Watt/m-Deg C	Temperature Deg C	Conductivity Watt/m-Deg C
16	59.34479	10	482
38	59.04548	11	538
93	57.99775	12	593
149	55.603	13	649
204	53.05856	14	704
260	50.21483	15	732
316	48.86777	16	760
371	47.25047	17	816
427	44.67695	18	871

Specific Heat

Temperature Deg C	Specific Heat J/gm-K	Temperature Deg C	Specific Heat J/gm-K	Temperature Deg C	Specific Heat J/gm-K	
16	0.4594	10	482	19	927	0.92885
38	0.46819	11	538	20	982	0.93303
93	0.48953	12	593	21	1038	0.93722
149	0.51212	13	649	21	1093	0.93931
204	0.53555	14	704	22	1149	0.6481
260	0.55354	15	732	24	1204	0.65061
316	0.57153	16	760	25	1260	0.66442
371	0.58952	17	816	26	1316	0.71295
427	0.60751	18	871			

Buttons: Reset, **New**, Ok, Save

List of existing Insulation

Create New Data

- Module to enter material data
- Density and emissivity
 - Conductivity as a function of temperature
 - Specific Heat as a function of temperature

The screenshot shows the 'Fuel Data' software interface. A callout bubble labeled 'List of existing Insulation' points to a dropdown menu containing a list of fuel types such as 'NATURAL GAS - 8897 Gross kcal/cu.m', 'COKE OVEN GAS - ARMCO', and 'PRODUCER GAS - LURGI'. Another callout bubble labeled 'Create New Data' points to the 'New' button at the bottom of the window. Red circles highlight several input fields: the 'Name' field, the 'Air / Fuel' ratio (9.44), the 'Flue / Fuel' ratio (10.46), the 'HHV' (9122.5) and 'LHV' (8045.6) heating values, the 'Product of Combustion' section (CO₂ [Dry] 0.11), and the 'Fuel Composition (%)' section (CH₄ 90). The 'New' button is also circled in red.

- Module to enter fuel data
- A/F, A/FI, HHV, LHV
 - POC - CO₂, H₂O, N₂
 - Fuel Composition

Data creation - Insulation

Entry Data

List of existing Insulation

Create New Data

Temperature Deg F	Conductivity kcal/m-hr-degC	Specific Heat Kcal/Kg-DegC
38	0.0533	0.203
538	0.0856	0.203
816	0.0856	0.203
1093	0.0856	0.203
1371	0.0856	0.203

Buttons: **Reset**, **New**, **Delete**, **Ok**, **Save**

- Module to enter insulation data
- Density
 - Conductivity as a function of temperature
 - Specific Heat as a function of temperature