



**FurnXpert** Continuous Heat Treat Pipes Application simulates Heat Transfer inside continuous heat treating furnaces to determine metallurgical changes in heated pipes during heat treating cycle.

The screenshot displays the FurnXpert software interface, which is used for simulating heat treatment processes in continuous heat treating furnaces. The main window, titled "Profile Screen", shows a "COMPUTED FURNACE PROFILE" with a graph of Temperature (T) in degrees Celsius versus Distance in Meter. The graph is divided into several zones: PH 1 (Pre heat), HH 1 (High heat), HH 2 (High heat), HH 3 (High heat), CL 1 (Cooling), and CL 2 (Cooling). The furnace temperature is 899 degrees Celsius, and the charge temperature is 804 degrees Celsius. The distance is 3.8354 meters, and the time is 5 minutes.

Below the graph, there are several configuration panels:

- Legend:** Shows the color coding for Furnace Temp. (blue), Charge Temp. (red), Target Temp. (cyan), and Furnace S. Pts. (yellow triangles).
- Furnace Configuration:** Contains general information (Name: Heat Treat Belt, Width: 30 in, Height: 20 in), specific information (Belt, Pusher, Roller, Rotary, Car), muffle information (Material: Metallic, Shape: Rectangular), and zone information (No. of Heating Zones: 4).
- Inlet Information:** Shows the number of inlets (2) and inlet details (Inlet Gas: Nitrogen, Position: 90).

The "Charge Selection" dialog box is open, showing a diagram of a pipe with dimensions TH (Thickness), OD (Outer Diameter), and CC (Center-to-Center distance). The charge details are as follows:

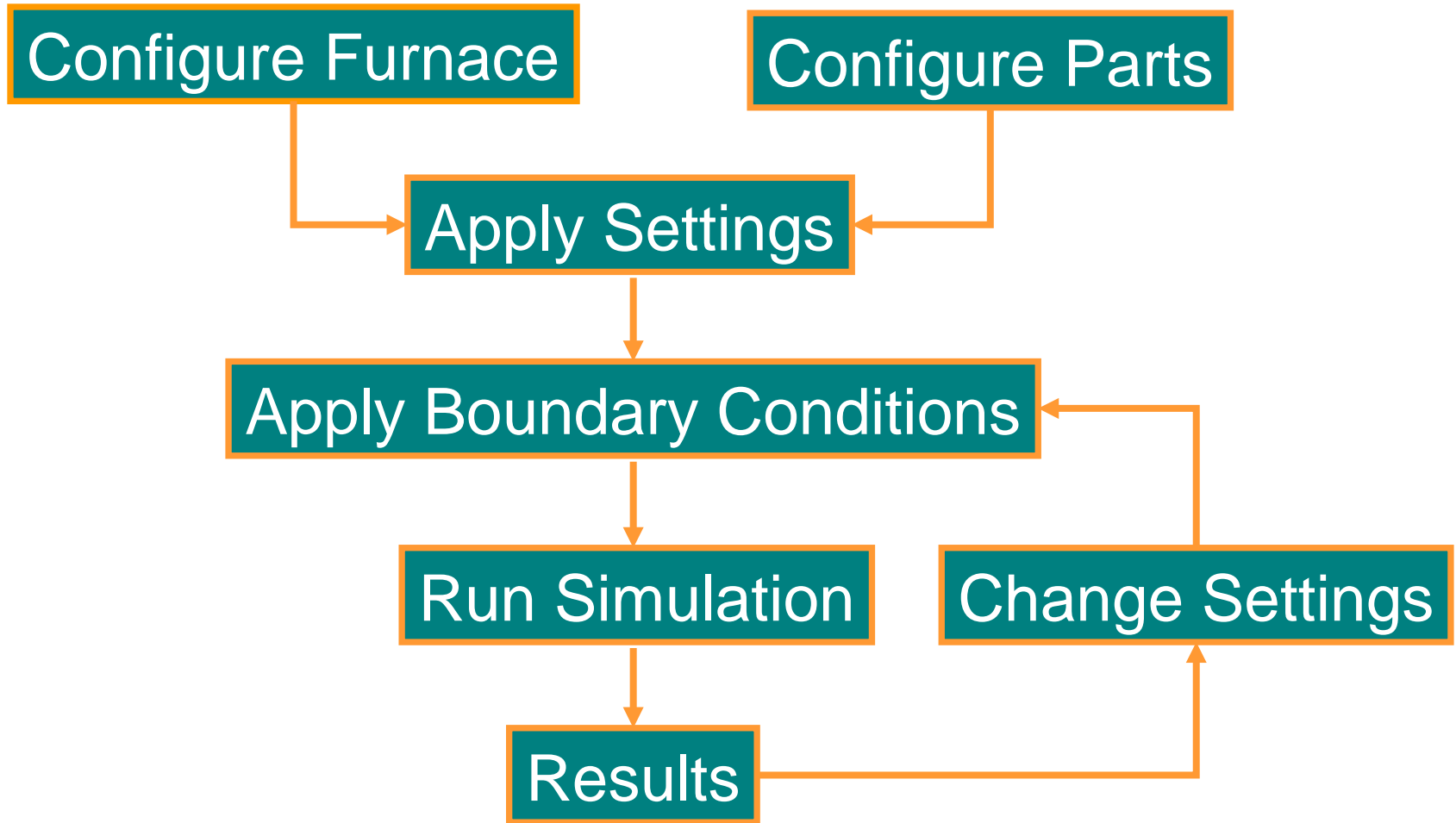
Parameter	Value	Unit
OD	5.08	cm
TH	0.254	cm
CC	7.62	cm
Nos.	7	

Other details include Grade: 1008 GRADE, Target Temperature: 700 Deg C, and Initial Temperature: 127 Deg C.

Buttons at the bottom of the dialog include New, Select Charge, Ok, Cancel, and Apply.

File Path: C:\Documents and Settings\Frances\Desktop\FurnXpert Pipes\Part\circular\_m.prt

- ⇒ Minimizes furnace design time
- ⇒ Reduces the requirements for test runs
- ⇒ Provides opportunity to quickly investigate multiple furnace designs
- ⇒ Enables viewing heat-treating process virtually
- ⇒ Offers platform for improved design accuracy
- ⇒ Bridges the gap between the furnace suppliers and furnace users
- ⇒ Can be used as a sales tool by furnace manufacturers as well as Heat-Treaters



The screenshot shows the main window of the FurnXpert software. On the left is a vertical toolbar with icons for 'Furnace', 'Profile', 'Charge', 'Settings', 'Run', 'Heat Audit', 'Reports', 'Help', and 'Exit'. The main area contains a document titled 'SETUP SIMULATE FURNACES' with the 'furnXPERT' logo and contact information for CompAS. A status bar at the bottom displays 'APP MODE: Heat Treatment', 'UNIT SYSTEM', 'FURNACE: Pipes-mks', 'Charge: Modified', and 'ANALYSIS: Lumped Mass'. Eight teal callout boxes with white text point to specific icons: 'CONFIGURE NEW FURNACES' points to the Furnace icon; 'CREATE FURNACE TEMPERATURE PROFILE' points to the Profile icon; 'CREATE /SELECT PIPES' points to the Charge icon; 'ADJUST SETTINGS' points to the Settings icon; 'RUN SIMULATION' points to the Run icon; 'RUN HEAT AUDIT' points to the Heat Audit icon; 'CREATE AND PRINT REPORTS' points to the Reports icon; and 'HELP' points to the Help icon.

CONFIGURE NEW FURNACES

CREATE FURNACE TEMPERATURE PROFILE

CREATE /SELECT PIPES

ADJUST SETTINGS

RUN SIMULATION

RUN HEAT AUDIT

CREATE AND PRINT REPORTS

HELP

The screenshot shows the 'FurnXpert : Continuous Heat-treat' application window. The menu bar includes File, View, Charge, Profile Option, Process, Reports, Tools, Properties, Analysis, Options, and Help. The toolbar contains icons for file operations and a button labeled 'AU'. A vertical sidebar on the left contains buttons for Furnace, Profile, Charge, Settings, Run, Heat Audit, Reports, Help, and Exit. The 'Furnace' button is circled in red. A callout box points to this button with the text: 'Create a New Furnace file or use a Furnace File already created'. The main window area displays a promotional graphic for 'furnXPERT' with the following text:

**SETUP FURNACES  
SIMULATE FURNACES**

**furnXPERT**<sup>®</sup>

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**Single User License**

FurnXPERT is a desktop software that simplifies the job of SETTING UP and SIMULATING industrial furnaces. The software has been developed to aid process engineers and furnace operators configure their furnaces, select parts, and run what-if analysis to determine the best furnace operating parameters.

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At the bottom of the window, a status bar displays: APP MODE: Heat Treatment, UNIT SYSTEM: MKS, FURNACE: Pipes-mks, Charge: Modified, ANALYSIS: Lumped Mass.

**Unit Selection**

Default

<b>Length</b>	in	<b>Energy</b>	Btu
<b>Time</b>	min	<b>Production Rate</b>	lbs/hr
<b>Temperature</b>	Deg F	<b>Power</b>	Btu/hr
<b>Weight</b>	lbs	<b>Energy Consumption</b>	Btu/lb
<b>Velocity</b>	in/min	<b>Flow</b>	Cfh

Ok Cancel Apply

APP MODE: Heat Treatment    UNIT SYSTEM: Default    FURNACE: None    PART: None    ANALYSIS: 2 D

Select Unit System From Drop Down Menu. We work with both Metric (SI) and English System

# Enter Furnace Data – Heating Zone

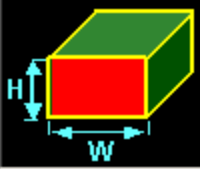
**Furnace Configuration**
✕

**General Information**

Name

Width  m

Height  m



**Muffle Information**

Belt

Material  Shape

**Dimensions**

OD  m Thickness  m

Height  m Radius of the D  m

**Insulation Details**

	1 (cm)	2 (cm)	3 (cm)	4 (cm)
Wall	30.4	30.4		
Roof	30.4			
Hearth	30.4			

**Specific Information**

**Belt** | Pusher | Roller | Rotary | Car

Width  m Max Belt Speed  m/min

Weight  kgs/sq.m

**Zone Information**

**Heating Zone** | Cooling Zone

No of Heating Zones  Heating Type

	Type	Fan	Heating Type	Length (m)	Trans. (m)	Tc Location (m)
1	PH	N	Gas	1.524	0	0.635
2	HH	N	Gas	1.524	0	0.762
3	HH	N	Gas	1.524	0	0.94
4	HH	N	Gas	1.524	0.38	
5						
6						
7						
8						
9						

**Inlet Information**

No of Inlets

**Inlet Details**

	Inlet Gas	Position (m)
1		
2		
3		
4		

Layout Save As **Ok** Cancel Apply

**INPUT ALL THE FURNACE DETAILS**

- Furnace Type
- Furnace Dimensions
- Muffle Information
- Insulation Type & Info
- Zone Information
- Inlet Information
- Inlet Details

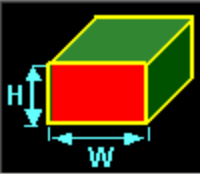
### Furnace Configuration

#### General Information

Name:

Width:  m

Height:  m



#### Muffle Information

Material:  Shape:

#### Dimensions

OD:  m Thickness:  m

Height:  m Radius of the D:  m

#### Insulation Details

	1	2	3	4
	(cm)	(cm)	(cm)	(cm)
Wall	30.4	30.4	<input type="text"/>	<input type="text"/>
Roof	30.4	<input type="text"/>	<input type="text"/>	<input type="text"/>
Hearth	30.4	<input type="text"/>	<input type="text"/>	<input type="text"/>

#### Specific Information

**Belt** | Pusher | Roller | Rotary | Car

Width:  m Max Belt Speed:  m/min

Weight:  kgs/sq.m

#### Zone Information

Heating Zone | **Cooling Zone**

No of Cooling Zones:

ID	Type	Length m	Trans. m	Cooling Gas	Slot #	Slot Width cm	Flow m <sup>3</sup> /hr
1	Rapid	3.048	0.254	Air	32	1.401	12740.0
2	Rapid	3.048	0	Air	32	1.401	12740.0
3	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
4	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
5	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
6	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

#### Inlet Information

No of Inlets:

#### Inlet Details

	Inlet Gas	Position m
1	<input type="text"/>	<input type="text"/>
2	<input type="text"/>	<input type="text"/>
3	<input type="text"/>	<input type="text"/>
4	<input type="text"/>	<input type="text"/>
7	<input type="text"/>	<input type="text"/>

**INPUT ALL THE COOLING ZONE DETAILS**  
 Zone Lengths  
 Slots  
 Slot Widths  
 Air Flow

**FurnXpert** File View Parts Profile Option Process Reports Tools Properties Analysis Options Help

**Furnace Configuration**

**General Information**  
Name: Heat Treat Belt  
Width: 30  
Height: 20  
Type: Belt  
Muffle:  No  Yes  
Muffle Information: Material: Metallic  
Dimensions: Width: 10 in, Height: 12 in  
Insulation Details: Wall: 3, Roof: 3, Hearth: 3

**Specific Information**  
Belt Pusher Roller Rotary Car  
Tc Location in: 30, 30, 30, 30, 30, 30, 30, 30, 30, 30

**Inlet Information**  
No of Inlets: 2  
Inlet Details:  
Inlet Gas Position in  
1 Nitrogen 90  
2 Nitrogen 220  
3  
4  
5  
6  
7

**Wall Insulation**  
Furnace Ambient 80 Deg F  
L1 L2  
L1: 3, FB  
L2: 3, IB  
Number of Layers: 2  
Layer 1: Material: Fire Brick, Thickness: 3 in  
Layer 2: Material: Insulating Brick, Thickness: 3 in  
Layer 3: Material: , Thickness: in  
Layer 4: Material: , Thickness: in  
Ok Cancel Apply

APP MODE: Heat Treatment UNIT SYSTEM: Default FURNACE: None PART: None ANALYSIS: 2D

**FurnXpert**  
File View Parts Profile Option Process Reports Tools Properties Analysis Options Help

**Furnace Configuration**

**General Information**  
Name: Heat Treat Belt  
Width: 30 in  
Height: 20 in  
Type: Belt

**Specific Information**  
Belt Pusher Roller Rotary Car  
Width: 18 in  
Weight: 5 lbs/sg ft

**Inlet Information**  
No of Inlets: 2

**Muffle**  
No Yes  
Maximum: 20

**Muffle Information**  
Material: Metallic Shape: Rect

**Dimensions**  
Width: 10 in Thickness:   
Height: 12 in Radius of the:   
Position: 90  
220

**Insulation Details**

	1	2	3
Wall	3	3	
Roof	3	3	
Hearth	3	3	

**Save**  
Save in: furnace  
History Desktop My Documents My Computer My Network P...  
Belt-1.frs  
Belt-2.frs  
Car Bottom.frs  
car\_bottom\_2.frs  
car\_bottom\_feet.frs  
car\_bottom\_meter.frs  
Sample pusher 2.frs  
Sample pusher.frs  
File name: Sample Belt English  
Save as type: FurnXpert Furnace File (\*.frs)  
Save Cancel

**Enter the name of the Furnace File**

Layout Save As Ok Cancel Apply

APP MODE: Heat Treatment UNIT SYSTEM: Default FURNACE: None PART: None ANALYSIS: 2 D

**Profile creation wizard**

**Profile Creation Wizard** Step - 1

Options for Profile Creation

- From Zone Temperatures
- From Distance Vs Temperature Input
- From Existing Part Profile
- From Existing Furnace Profile

Input setpoints for every zone to generate a furnace profile

Cancel <<Back Next>> Finish

CL 2 510

Legend

- Furnace Temperature
- ▼ Furnace Set Points

Profile Info

Profile Source	None
Profile Mode	None

Create Profile Temp. Scale

OK Cancel

File Path : None

APP MODE: Heat Treatment UNIT SYSTEM: Default FURNACE: Heat Treat Belt PART: None ANALYSIS: 2 D

# Profile from Zone Temperature

**Profile Creation Wizard** *Step - 2*

**Profile From Zone Temperature**

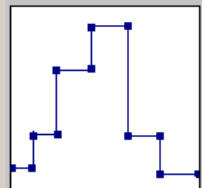
**Set Points**

Zone 1	<input type="text" value="100"/>	Deg F	Zone 6	<input type="text"/>	Deg F
Zone 2	<input type="text" value="200"/>	Deg F	Zone 7	<input type="text"/>	Deg F
Zone 3	<input type="text" value="300"/>	Deg F	Zone 8	<input type="text"/>	Deg F
Zone 4	<input type="text" value="400"/>	Deg F	Zone 9	<input type="text"/>	Deg F
Zone 5	<input type="text"/>	Deg F			

**Profile Creation Wizard** *Step - 3*

**Profile From Zone Temperature**

**Profile Type**



- Step "Up" / Step "Down" Ramp
- Slant Gradient Ramp
- Smooth Slope Ramp

**Profile Creation Wizard** *Step - 4*

**Profile From Zone Temperature**

**Cooling Zone Input**

- Cooling Gradient
- Zone Temperature

**Transition Zone**

Gradient ( Deg F / in )	Exit Temp. ( Deg F )
Zone <input type="text" value="5"/>	<input type="text"/>

**Cooling Zones**

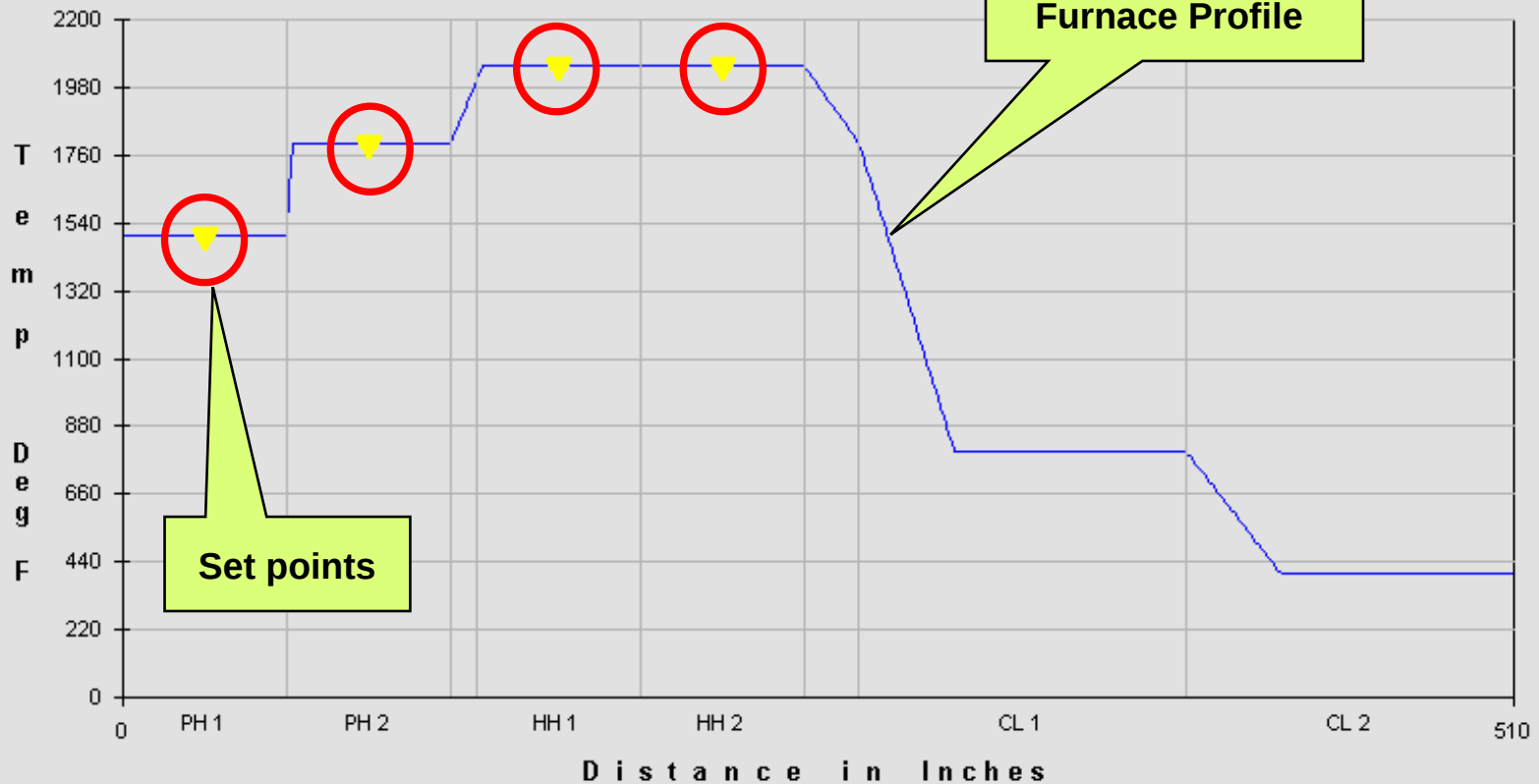
Zone 1	<input type="text"/>	<input type="text" value="800"/>
Zone 2	<input type="text"/>	<input type="text" value="400"/>
	<input type="text"/>	<input type="text"/>
	<input type="text"/>	<input type="text"/>
	<input type="text"/>	<input type="text"/>

Three options to choose from

Profile

X

## FURNACE PROFILE



## Legend

- Furnace Temperature
- ▼ Furnace Set Points

## Profile Info

Profile Source **From Zone Temperatures**  
 Profile Mode **Step "Up" / Step "Down" Ramp**

Edit Profile

Temp. Scale

OK

Cancel

File Path : None

# Profile from Furnace Temperature Data

### Profile Creation Wizard

Step - 1

#### Profile From Existing Furnace Profile

Select File

C:\Program Files\CompAS Controls\FurnXpert Released Application\FurnXpert\_ContP

[ Select a file with .csv extension ]

Buttons: Cancel, Back, Next>>, Finish

### Profile Creation Wizard

Step - 3

#### Profile From Existing Furnace Profile

##### Set Points

Zone 1	1000	Deg F	Zone 6		Deg F
Zone 2	1100	Deg F	Zone 7		Deg F
Zone 3	1150	Deg F	Zone 8		Deg F
Zone 4	1200	Deg F	Zone 9		Deg F
Zone 5	1200	Deg F			

Buttons: Cancel, <<Back, Next>>, Finish

### Profile Creation Wizard

Step - 4

#### Profile From Existing Furnace Profile

##### Cooling Zone Input

Cooling Gradient  
 Zone Temperature

##### Transition Zone

Zone	20	
------	----	--

Buttons: Edit, Set Default

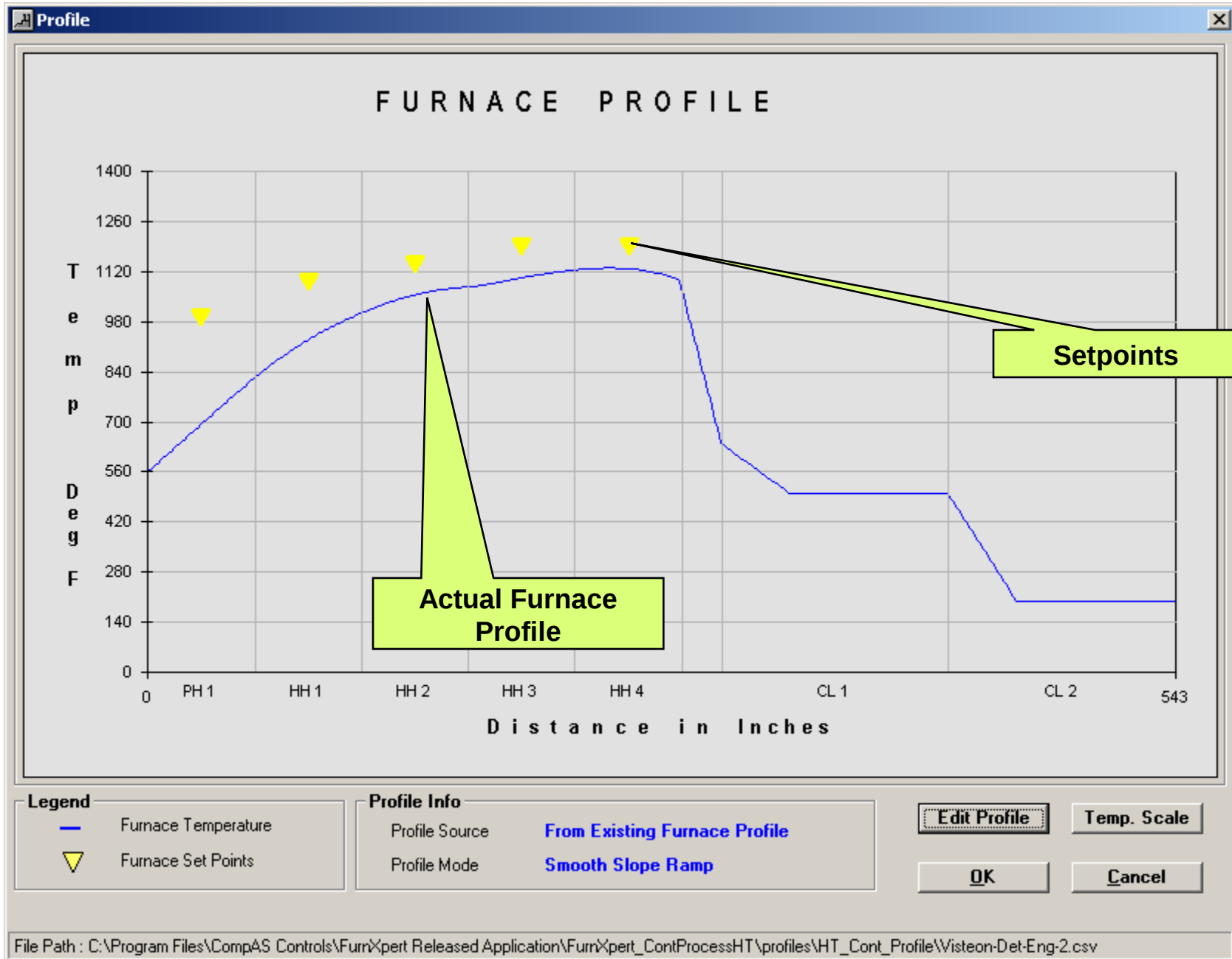
##### Cooling Zones

	Gradient ( Deg F / in )	Zone Temp. ( Deg F )
Zone 1		500
Zone 2		200

Buttons: Cancel, <<Back, Next>>, Finish

Select Furnace Temperature profile

Setpoints



## CREATE/SELECT CHARGE

- Enter OD/Thickness
- Enter Center to Center distance
- Enter number of pipes
- Select Steel Grades

The dialog box is titled "Charge Selection". At the top, there is a "Part Drawing" showing four circles representing pipes. The first circle is labeled with "TH" for thickness and "OD" for outer diameter. A double-headed arrow between the centers of the first two circles is labeled "CC" for center-to-center distance. Below the drawing are two main sections: "Charge" and "Other Details".

Field	Value	Unit
OD	5.08	cm
TH	0.254	cm
CC	7.62	cm
Nos.	7	

The "Other Details" section includes:

- Grade: 1008 GRADE (dropdown menu)
- Target Temperature: 700 Deg C
- Initial Temperature: 127 Deg C

At the bottom, there are buttons for "New", "Select Charge", "Ok", "Cancel", and "Apply". The "File Path" is shown as "C:\Documents and Settings\Frances\Desktop\Furn\pert Pipes\Part\circular\_m.prt".

Part Drawing

### Charge

OD 5.08 cm  
TH 0.254 cm  
CC 7.62 cm  
Nos. 7

### Other Details

Grade 1008 GRADE  
Target Temperature 700 Deg C  
Initial Temperature 127 Deg C

New

Select Charge

Ok

Cancel

Apply

File Path : C:\Documents and Settings\Frances\Desktop\Furn\pert Pipes\Part\circular\_m.prt

Grade

Charge Info

New Charge

Select Created Charge

Created Parts

Open

Look in: furnace

- Other furnaces
- furnace\_2GMKS.frs
- Furnace\_3.frs
- furnace\_3E.frs
- Furnace\_E.frs
- furnace\_M.frs
- furnace\_pipes\_gas\_17\_11\_200
- Test1.frs

My Recent Documents

Desktop

My Documents

My Computer

My Network Places

File name:

Open

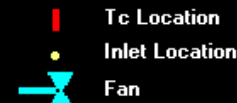
Files of type:

LINEMOD Furnace File(\*.frs)

Cancel

Provides the capability to change the process settings:

- Zone Setpoints
- Air Flow Rate in Cooling Zone
- Gas Flow Rate



Can change the Zone Setpoints

Can change Cooling Zone Air Flow rates

Can change belt speed

Can change Gas Flow rates

**Process Settings**

Number: 4

Zone #	Temp. Deg C	Emissivity [0-1]	Fan Speed rpm
1	760	0.6	
2	871	0.6	
3	899	0.6	
4	927	0.6	

Number: 2

Zone #	Type of Cooling	Flow Rate m <sup>3</sup> /hr
1	Rapid	12740.0
2	Rapid	12740.0

Number: 0

Zone #	Gas	Flow Rate m <sup>3</sup> /hr

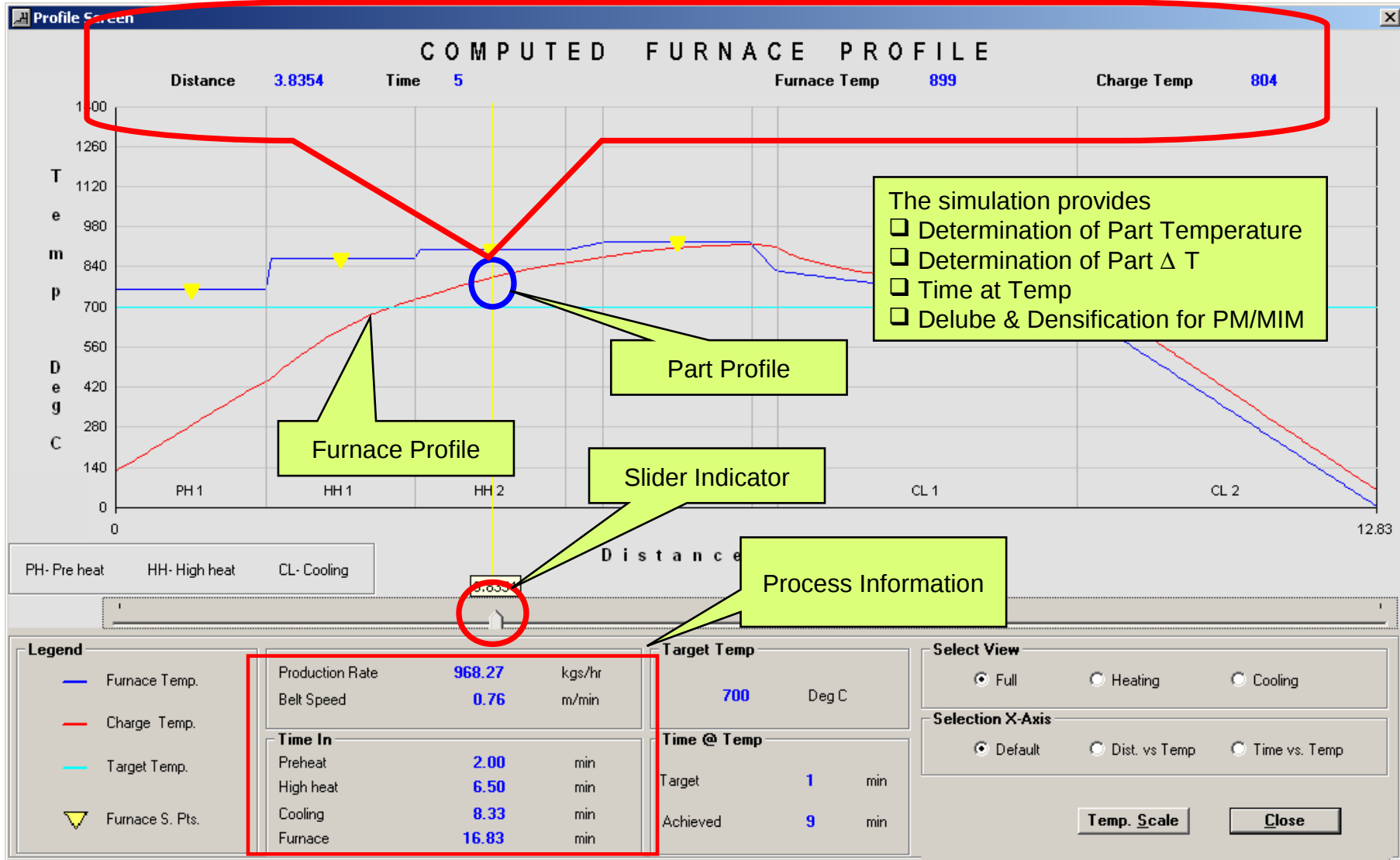
**Heating Zones**

**Cooling Zones**

**Inlets**

Belt Speed: 0.762 m/min

Buttons: Set Default, Edit Data, OK, Cancel, Apply



## Combustion Parameters

## Combustion Details

Zone	Type	Gross Heat kCal/hr	Fuel Rate Litres/Hr	Air Rate m <sup>3</sup> /hr	Recup. Heat kCal/hr	Flue Loss kCal/hr	Efficiency %
1	PH						
2	HH	241,825.20	3,543.98	255.65	1,788.40	244,522.10	46.65
3	HH	135,275.90	1,982.49	143.01	1,000.42	118,789.90	45.00
4	HH	83,731.40	1,227.09	88.52	619.23	46,423.20	42.87

## Heat Audit

## Heat Details

Zone	Heat to Charge kCal/hr	Wall Loss kCal/hr	Heat To Gas kCal/hr	Heat to Belt kCal/hr	Other Heat kCal/hr	Total Heat kCal/hr
1	10,633.84	7,542.25	0.00	57,931.83		185,514.00
2	51,509.80	8,801.98	0.00	52,494.95		112,806.70
3	28,308.42	9,150.13	0.00	23,410.59		60,869.14
4	12,073.47	11,661.70	0.00	12,164.57		35,899.74

The simulation provides

- Heat Audit to determine zone wise heat losses
- Calculates Heat Input, Fuel Rate, Air Rate, Flue Loss for Fuel Heating

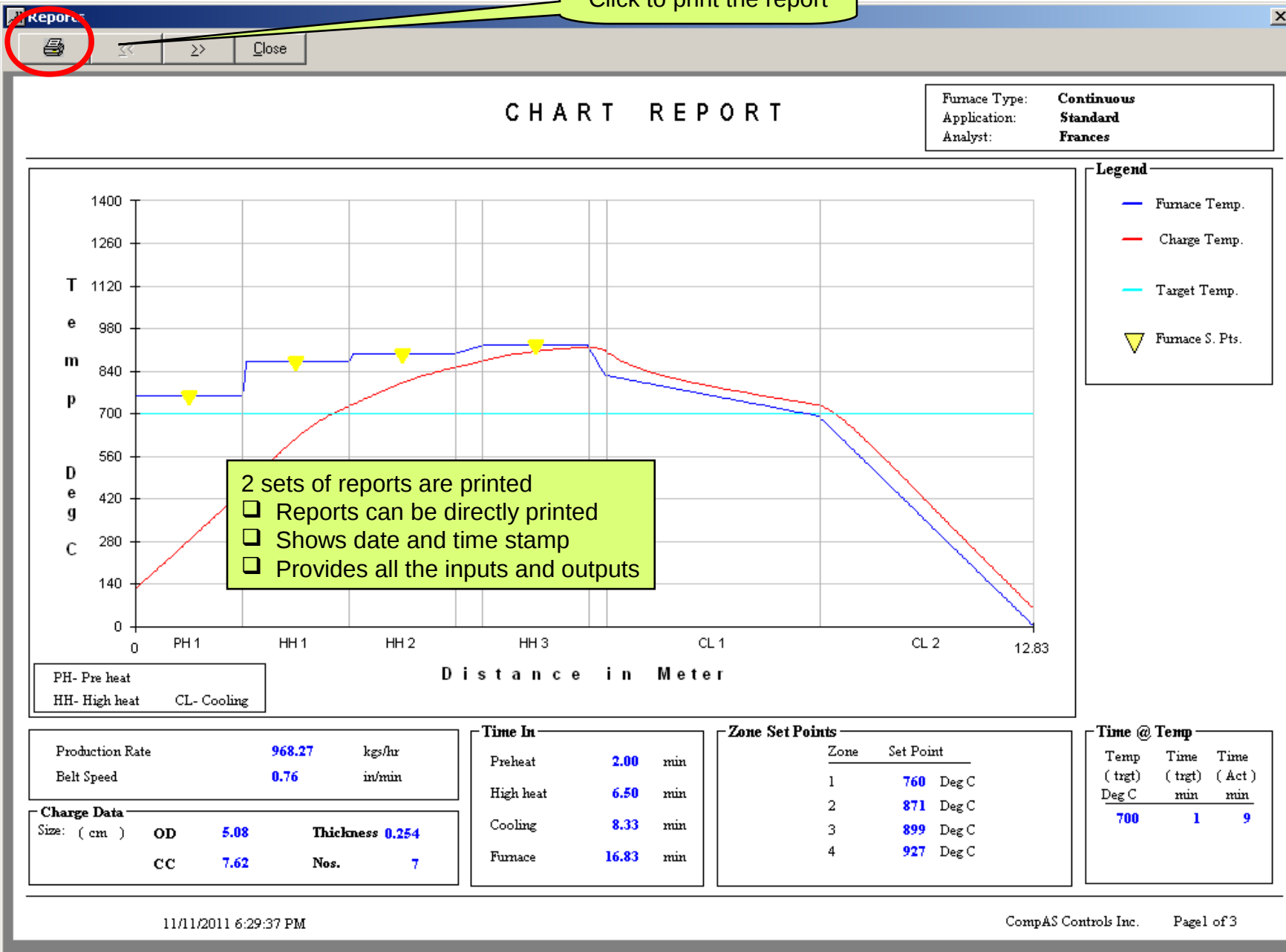
Total	132,531.53	37,156.06	0.00	145,402.02		315,089.59
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Total Power	315,089.59	kCal/hr	Energy Consumption	1,362,444.00	J/kg
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Combustion Parameters

Close

Click to print the report



Click to print the report

reports

Close

## CHART REPORT

Furnace Type: **Continuous**  
 Application: **Standard**  
 Analyst: **Frances**

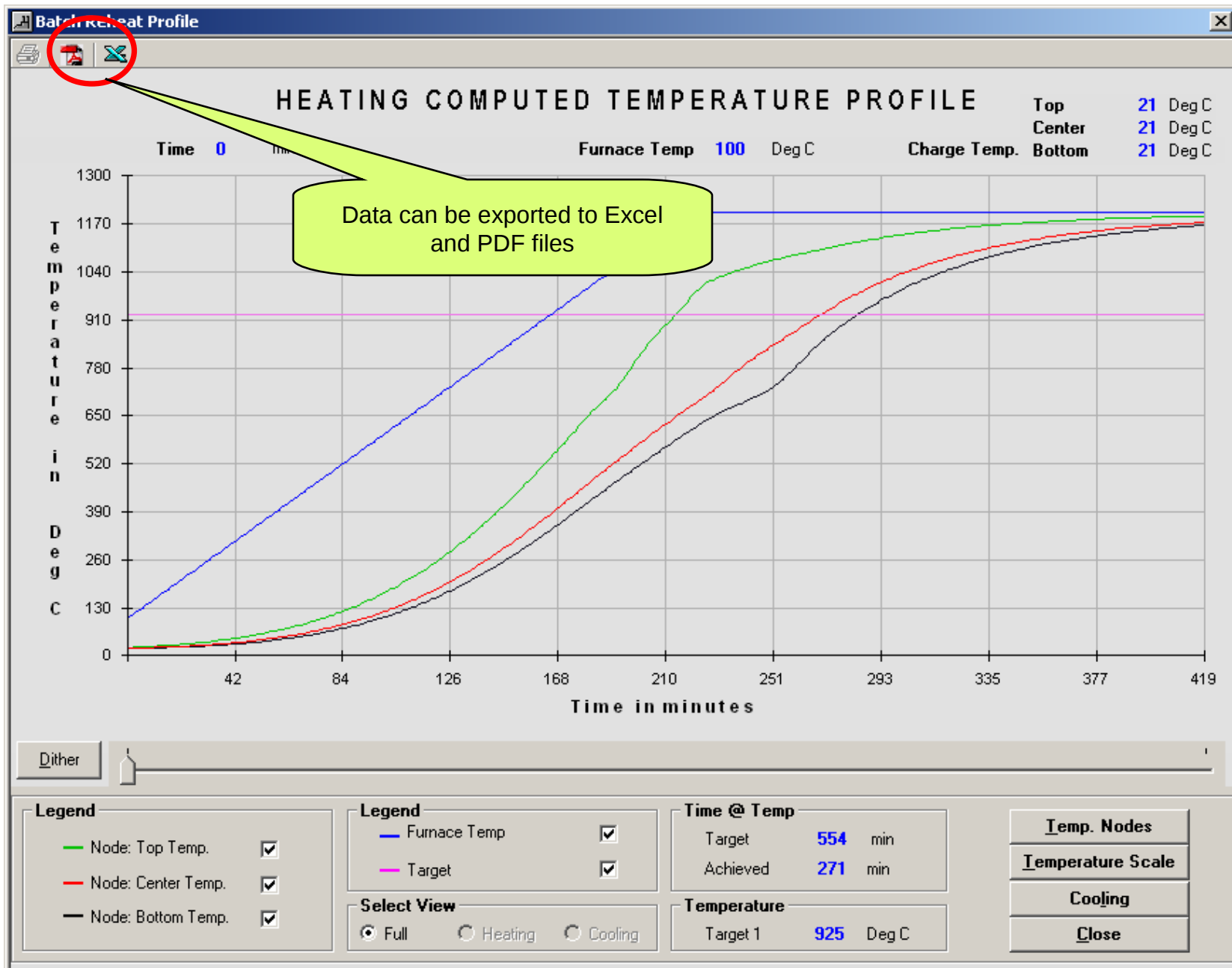
---

**Heat Details**

Zone	Heat To Charge kCal/hr	Wall Loss kCal/hr	Heat To Gas kCal/hr	Heat to Belt kCal/hr	Other Heat kCal/hr	Total Heat kCal/hr
1	40,639.84	7,542.25	0.00	57,331.89	N/A	105,514.00
2	51,509.80	8,801.98	0.00	52,494.95	N/A	112,806.70
3	28,308.42	9,150.13	0.00	23,410.59	N/A	60,869.14
4	12,073.47	11,661.70	0.00	12,164.57	N/A	35,899.74
Total	132,531.53	37,156.06	0.00	145,402.02	N/A	315,089.59
Total Power	315,089.59	kCal/hr	Energy Consumption	1,362,444.00	J/kg	

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11/11/2011 6:29:37 PM CompAS Controls Inc. Page 2 of 3



# Data Porting to Excel Spread Sheet

Microsoft Excel - test.xls

File Edit View Insert Format Tools Data Window Help

Type a question for help

A1 Batch Reheat Profile

Batch Reheat Profile										
Count	Time (min)	Furnace Temp (Deg C)	Top Node (Deg C)	Center Node (Deg C)	Bottom Node (Deg C)	Heat Rate (MKcal/Hr)	Available Heat (MKcal/Hr)	Fuel Rate (Kg/Hr)	Air Rate (m³/Hr)	
1	0	100	21	21	21					
2	1	105	22	21	21	1.24662825	0.975649688	54.7507	12055.2	
3	2	110	22	21	21	1.24985425	0.975974625	54.8924	12086.39	
4	3	115	23	21	21	1.2531585	0.976349188	55.0375	12118.35	
5	4	120	23	21	21	1.2565065	0.976746188	55.1845	12150.72	
6	5	125	24	22	21	1.25988475	0.97715475	55.3329	12183.39	
7	6	130	24	22	21	1.2632915	0.9775735	55.4825	12216.33	
8	7	135	24	22	21	1.266718	0.977995563	55.633	12249.47	
9	8	140	25	22	21	1.270171625	0.9784265	55.7847	12282.87	
10	9	145	25	22	21	1.273639125	0.978855875	55.937	12316.4	
11	10	150	26	22	22	1.2771315	0.979292125	56.0904	12350.17	
12	11	155	26	23	22	1.28064575	0.979732875	56.2447	12384.16	
13	12	160	27	23	22	1.28418075	0.980177063	56.4	12418.34	
14	13	165	27	23	22	1.287737	0.980624938	56.5562	12452.73	
15	14	170	27	23	22	1.29131725	0.9810785	56.7134	12487.35	
16	15	175	28	23	22	1.294911875	0.981530438	56.8713	12522.11	
17	16	180	28	24	23	1.298532125	0.981989125	57.0303	12557.12	
18	17	185	29	24	23	1.302177875	0.982454188	57.1904	12592.38	
19	18	190	29	24	23	1.305840875	0.982919438	57.3513	12627.8	
20	19	195	30	25	23	1.309527625	0.983389688	57.5132	12663.45	
21	20	200	30	25	23	1.313235125	0.983862438	57.676	12699.3	
22	21	205	31	25	24	1.316962875	0.98433725	57.8397	12735.35	
23	22	210	32	26	24	1.320704	0.984809063	58.004	12771.53	
24	23	215	32	26	24	1.3244685	0.985285063	58.1694	12807.93	
25	24	220	33	26	24	1.32826025	0.985767938	58.3359	12844.6	
26	25	225	33	27	25	1.332075625	0.986255063	58.5035	12881.5	
27	26	230	34	27	25	1.335911	0.986743375	58.6719	12918.58	
28	27	235	35	27	25	1.33977525	0.987239563	58.8416	12955.95	
29	28	240	35	28	26	1.34371525	0.987736813	59.0147	12994.05	
30	29	245	36	28	26	1.347761375	0.988241063	59.1924	13033.18	
31	30	250	37	29	26	1.35183225	0.988748625	59.3712	13072.55	
32	31	255	38	29	27	1.355932625	0.989262875	59.5512	13112.2	
33	32	260	38	30	27	1.360050125	0.989774563	59.7321	13152.02	
34	33	265	39	30	27	1.364188875	0.9902865	59.9138	13192.04	

Ready NUM

Start Inbox - Outlook Express Presentation on Ccidemo Microsoft PowerPoint - [...] FurnXpert : Reheat Batc... Microsoft Excel - test...

100% 9:57 AM

## FurnXpert Continuous Heat Treat Process

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## Create Furnace

Selecting **Continuous Heat Treat Process** from furnace selection will take you to the Continuous Heat Treat Process. With the selection of Continuous Heat Treat Process application the screen shown in figure 7 appears.

**Furnace Configuration**

**General Information**

Name: Belt 2  
 Width: 71.7 in  
 Height: 37.5 in  
 Type: Belt  
 Muffle:  No  Yes  
 Maximum Belt Speed: 20 in/min

**Muffle Information**

Material: Metallic Shape: Rectangular  
 Dimensions: Width: 5 in Thickness: 1 in Height: 36 in Radius of the D: in

**Insulation Details**

Wall: FB IB  
 Roof: FB IB  
 Hearth: FB IB

**Specific Information**

Belt Pusher Roller Pokay Car  
 Width: 38.5 in  
 Weight: 5 lb/foot

**Zone Information**

Heating Zone Cooling Zone  
 No of Heating Zones: 5

	Type	Fan	Heating Type	Length in	Trans in	Tc Location in
1	PH	Y	Gas	36.6	0	38.2
2	HH	N	Electric	36.4	0	38.2
3	HH	N	Electric	36.4	0	38.2
4	HH	N	Electric	36.4	0	38.2
5	HH	N	Electric	36.4	0	38.2
6						
7						
8						
9						

**Inlet Information**

No of Inlets: 2

**Inlet Details**

Inlet Gas Position in

1	Air	100
2	Nitrogen	100
3		
4		
5		
6		
7		

Layout Save As OK Cancel Copy

Figure 7: Configure Continuous Heat Treat Process Furnace

The screen above (Figure 7) displays a configured furnace. There are six sets of inputs required to configure a new furnace. They are:

- General Information
- Muffle Information
- Insulation Details
- Furnace Specific Information
- Zone Information
- Inlet Information

Each group has sets of questions and they are:

User Manual is included in Help

**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

Module to enter insulation data

- Density
- Conductivity as a function of temperature
- Specific Heat as a function of temperature

**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

**Conductivity**

Temperature Deg C	Conductivity Watt/m-Deg C	Temperature Deg C
1	16	59.34479
2	38	59.04548
3	93	57.99775
4	149	55.603
5	204	53.05856
6	260	50.21483
7	316	48.86777
8	371	47.25047
9	427	44.67695
10	482	
11	538	
12	593	
13	649	
14	704	
15	732	
16	760	
17	816	
18	871	

**Material Data**

Material Name: 1008 GRADE

Units:  English Unit  Metric Unit

Density: 1008 GRADE

Emissivity: HI CARBON (1.22%) GRADE

**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
1	16	0.4594	10	482	0.66735
2	38	0.46819	11	538	0.71086
3	93	0.48953	12		
4	149	0.51212	13		
5	204	0.53555	14		
6	260	0.55354	15		
7	316	0.57701	16	760	0.99701
8	371	0.60099	17	816	0.88533
9	427	0.62549	18	871	0.88701
10	482	0.65051	19	927	0.92885
11	538	0.67605	20	982	0.93303
12	593	0.70214	21	1038	0.93722
13	649	0.72878	22	1093	0.93931
14	704	0.75588	23	1149	0.6481
15	732	0.78344	24	1204	0.65061
16	760	0.81146	25	1260	0.66442
17	816	0.83994	26	1316	0.71295
18	871	0.86888			

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. The main window has a title bar 'Fuel Data' and a close button. The interface includes a dropdown menu for 'Name' with a list of fuel types, a 'Type of Fuel' section with radio buttons for 'Gaseous' and 'Liquid', and several input fields for 'Ratio (in Cu.m / Cu.m)', 'Heating Value (in KCal / Cu.m)', and 'Product of Combustion (as fraction 0 - 1)'. There are also sections for 'Fuel Composition (%)' and a 'Calculator' button. At the bottom, there are buttons for 'Reset', 'New', 'Ok', and 'Save'. Red circles highlight the 'Name' dropdown, the 'Air / Fuel' and 'Flue / Fuel' ratio fields, the 'HHV' and 'LHV' heating value fields, the 'Product of Combustion' section, the 'Fuel Composition (%)' section, and the 'New' button. Green callouts point to the 'Name' dropdown (labeled 'List of existing Insulation') and the 'New' button (labeled 'Create New Data').

Module to enter fuel data

- A/F, A/FI, HHV, LHV
- POC - CO<sub>2</sub>, H<sub>2</sub>O, N<sub>2</sub>
- Fuel Composition

The screenshot shows the 'Heat Loss Calculation' software interface. It features a left-hand control panel and a right-hand visualization area. The control panel includes input fields for 'Number of Layers' (2), 'Furnace Temperature [Tf]' (1300 Deg C), and 'Ambient Temperature [Ta]' (38 Deg C). It also has a section for 'Apply Resistance to Inside Wall' with 'Yes' selected. Below this are four layer configuration sections. Layer 1 is set to 'Fire Brick' with a thickness of 6 cm. Layer 2 is set to 'Insulating Brick' with a thickness of 6 cm. Layers 3 and 4 are currently empty. The right-hand area displays a cross-section of the furnace wall with temperature points T1 (1064), T2 (957), and T3 (167) marked. It also shows thermal conductivities K1 (122.88) and K2 (16.65) for the layers, and their respective thicknesses L1 and L2. A 'Temperatures' table at the bottom right lists T1 through T5. The 'Heat Flux' result is shown as 2193.38 KCal/hr/sq.m. At the bottom, there are buttons for 'Close', 'Show Calculation Sheet', 'Reset', and 'Calculate'.

Temperature	Value	Unit
T1	1064	Deg C
T2	957	Deg C
T3	167	Deg C
T4		Deg C
T5		Deg C

Property	Value	Unit
Heat Flux	2193.38	KCal/hr/sq.m
Conductivities [K1, K2, K3, K4] in :		KCal/m/hr/Deg C

Number of Layers

Furnace Temperature

Ambient Temperature

Select the refractory material

Heat Loss result

Module to calculate heat loss through insulation

**Heat Storage Calculations**

Number of Layers: 2  
 Height of Refractory: 20 cm  
 Ambient Temperature [Ta]: 30 Deg C  
 Init Furnace Temperature [Ti]: 500 Deg C  
 Final Furnace Temperature [Tf]: 1300 Deg C

Apply Resistance to Inside Wall:  Yes  No

**Layer 1**  
 Material: Fire Brick  
 Thickness [L1]: 6 cm

**Layer 2**  
 Material: Insulating Brick  
 Thickness [L2]: 6 cm

**Layer 3**  
 Material:   
 Thickness [L3]: cm

**Layer 4**  
 Material:   
 Thickness [L4]: cm

**Temperature Profile Diagram:**  
 T1: 1300, T2: 1162, T3: 200  
 K1: 126.46, K2: 18.10  
 [Tf] and [Ta] labels indicate furnace and ambient temperatures respectively.

Initial Furnace Temperature  Final furnace Temperature

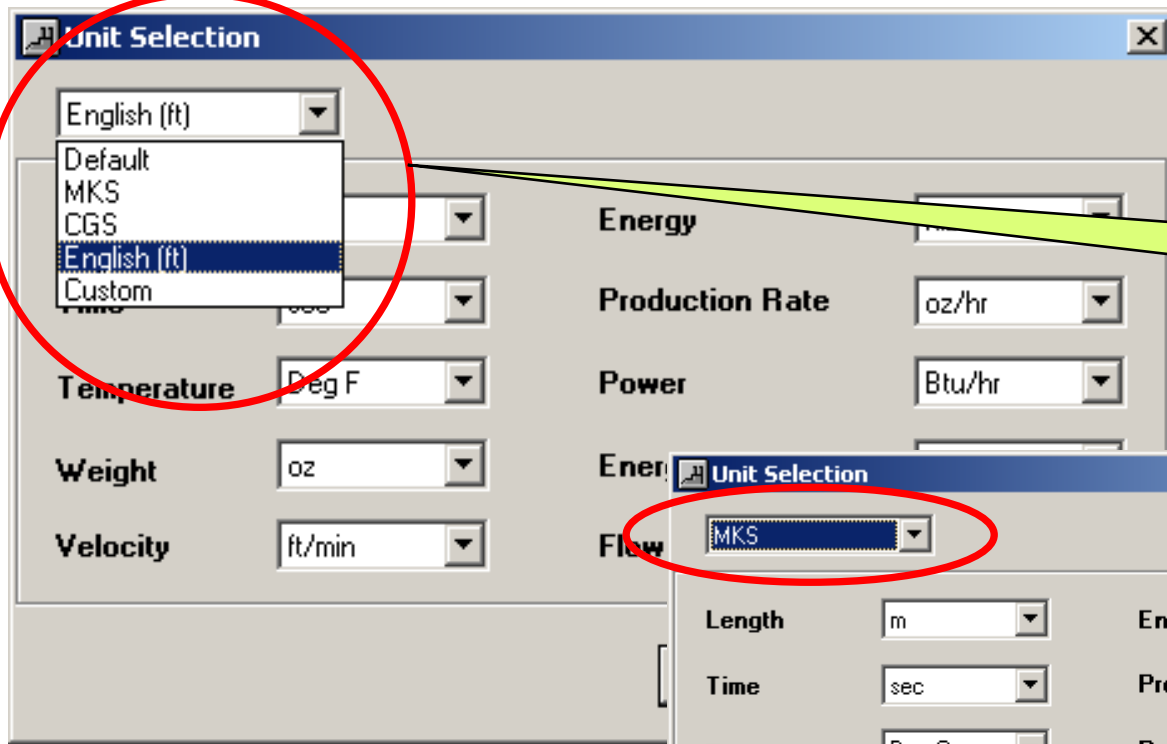
Average Temperature Deg C	At Init. Furnac Temp.	At Final Furnace Temp.	Heat Gain Btu/sq.ft
L1	478	1231	9478.35
L2	268	681	1019.66
L3			
L4			
<b>Total Gain</b>			<b>10498.01</b>

Ready    Close    Show Calculation Sheet    Reset    Calculate

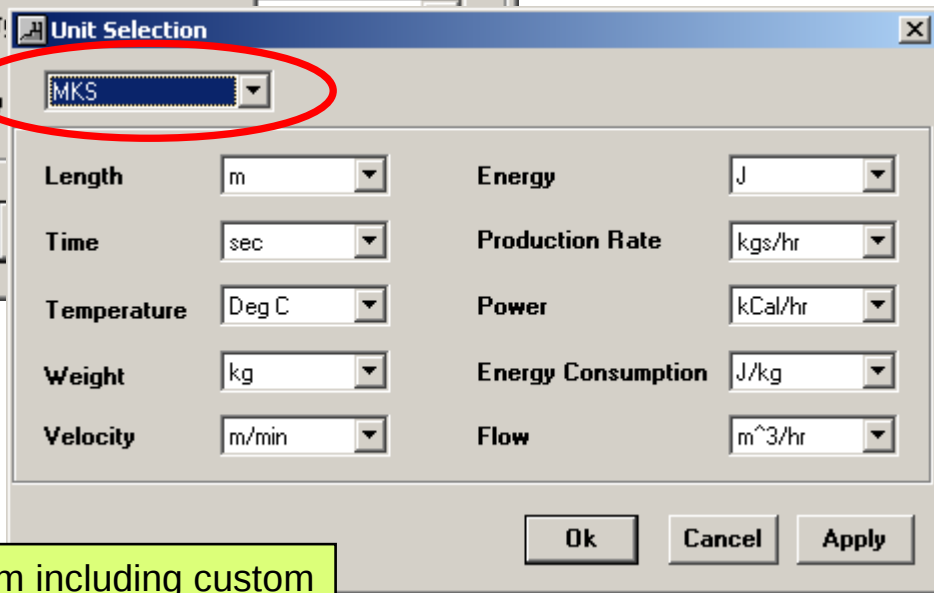
Select the refractory material

Heat Storage result

Module to calculate heat storage in insulation



Different unit system can be selected



The software is designed for any unit system including custom