DOFASCO

AUTOMATION TECHNOLOGY

Real Solutions in Real-Time

Dofasco's Enhanced Monitoring System

Vit Vaculik and Adam Smyth

OSI PI Users Conference

San Francisco

May 13, 2003

Agenda

- Introduction
  - Caster SOS™ and New Requirements
- System Enhancements
  - Visualization
  - Expanded Monitoring
  - Historical Support Utilities
- Summary

Agenda

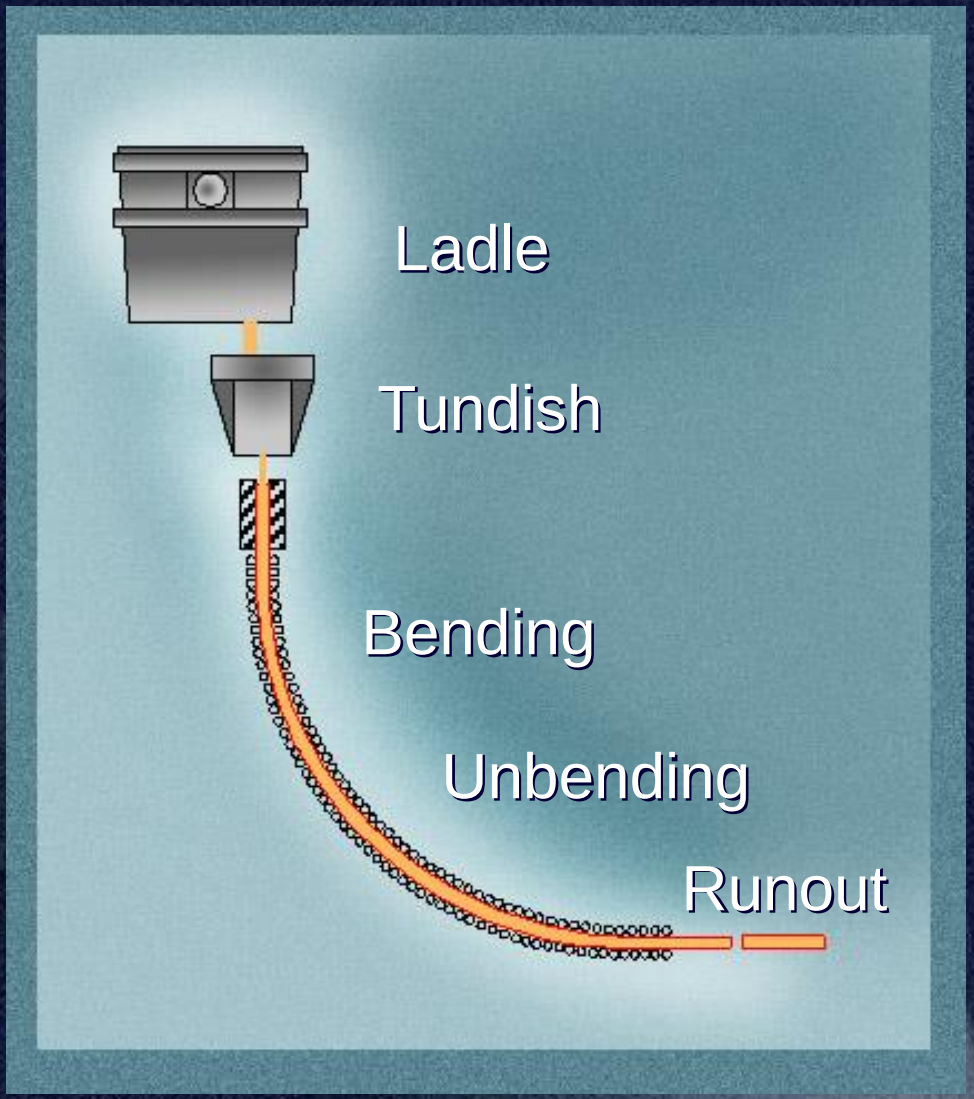
- Introduction
  - Caster SOS^{TM} and New Requirements
- System Enhancements
  - Visualization
  - Expanded Monitoring
  - Historical Support Utilities
- Summary

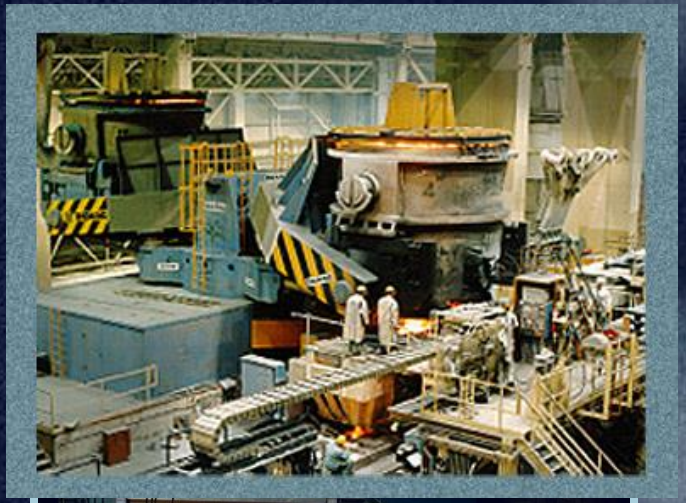
Dofasco Hamilton Works

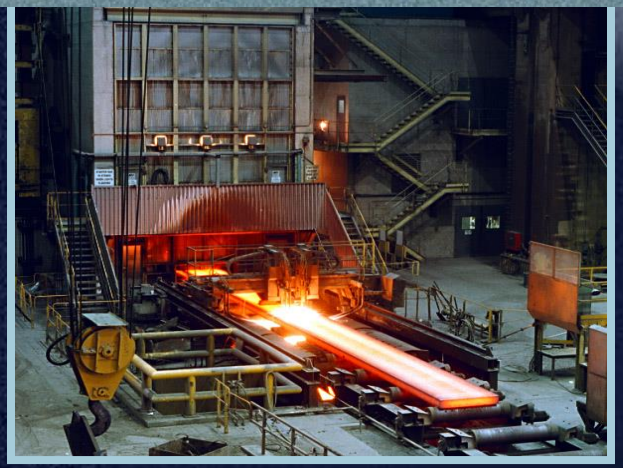
- One of Canada's largest fully integrated steel producers
- ≈ 4.8 million tons of steel shipped in 2002 with sales ≈ $3.6 billion (Cdn)
- ≈ 7500 employees
  - ≈ 1000 in technology areas
- A North American leader in profitability

DOFASCO AUTOMATION + TECHNOLOGY

The Process







Caster SOS™

Opportunities

Caster Stability/Quality Prediction/Breakout Avoidance

Process

Data

Temperatures

Cooling Water Data

Stopper Rod Position

Heat Transfer

Negative Strip Time

Etc.

DAT Solution

Caster SOS

Action

Automatically Slow Cast Speed

Automatically Disposition Product

Strand Operator Slows Down Cast Speed

Operator Deselects Faulty Signal from the Model

Information

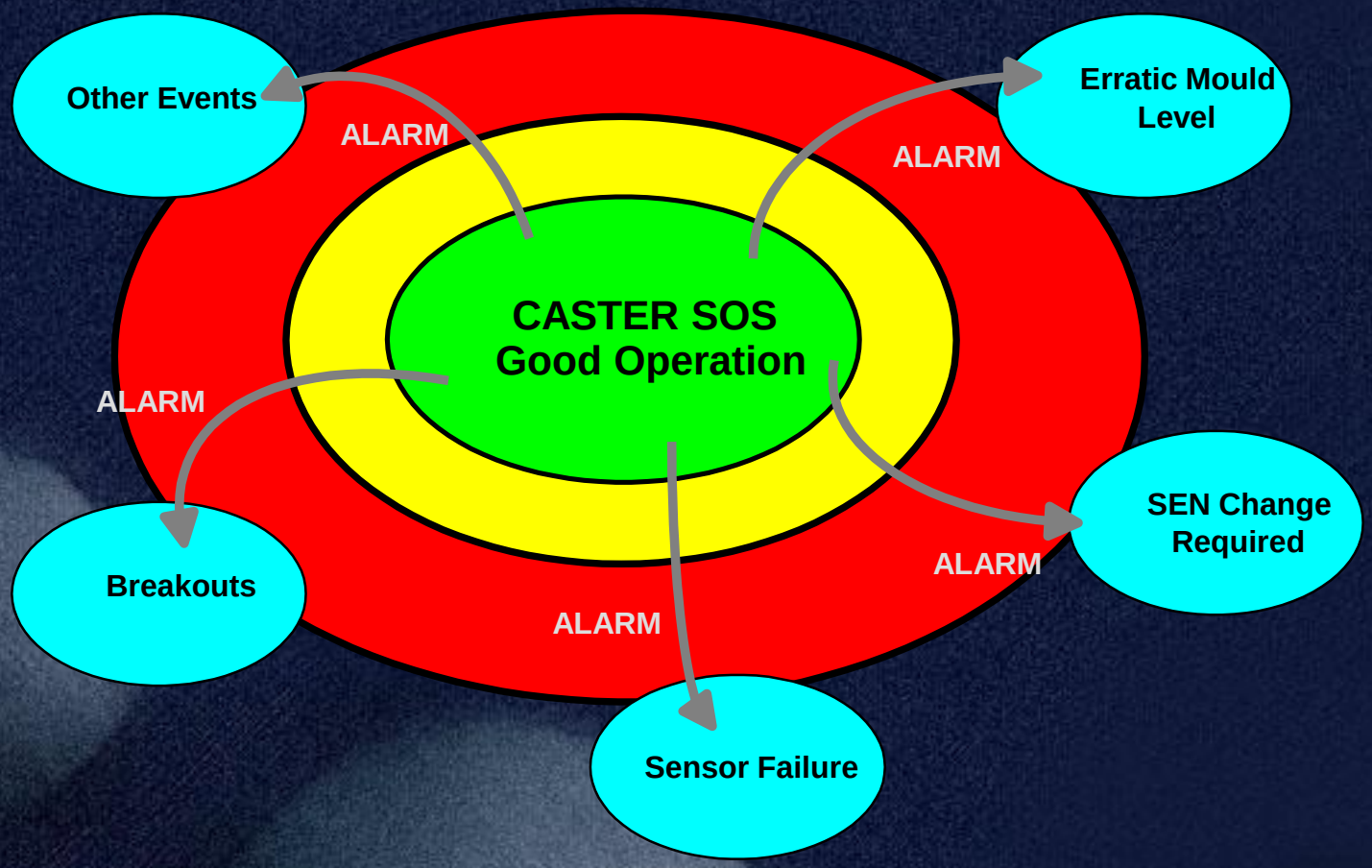
Alarms and Warnings through 2 Stability Indices

Top 5 Influences to the Problem

Trending of Data

Thermal Contour Map

Caster SOS™ Concept



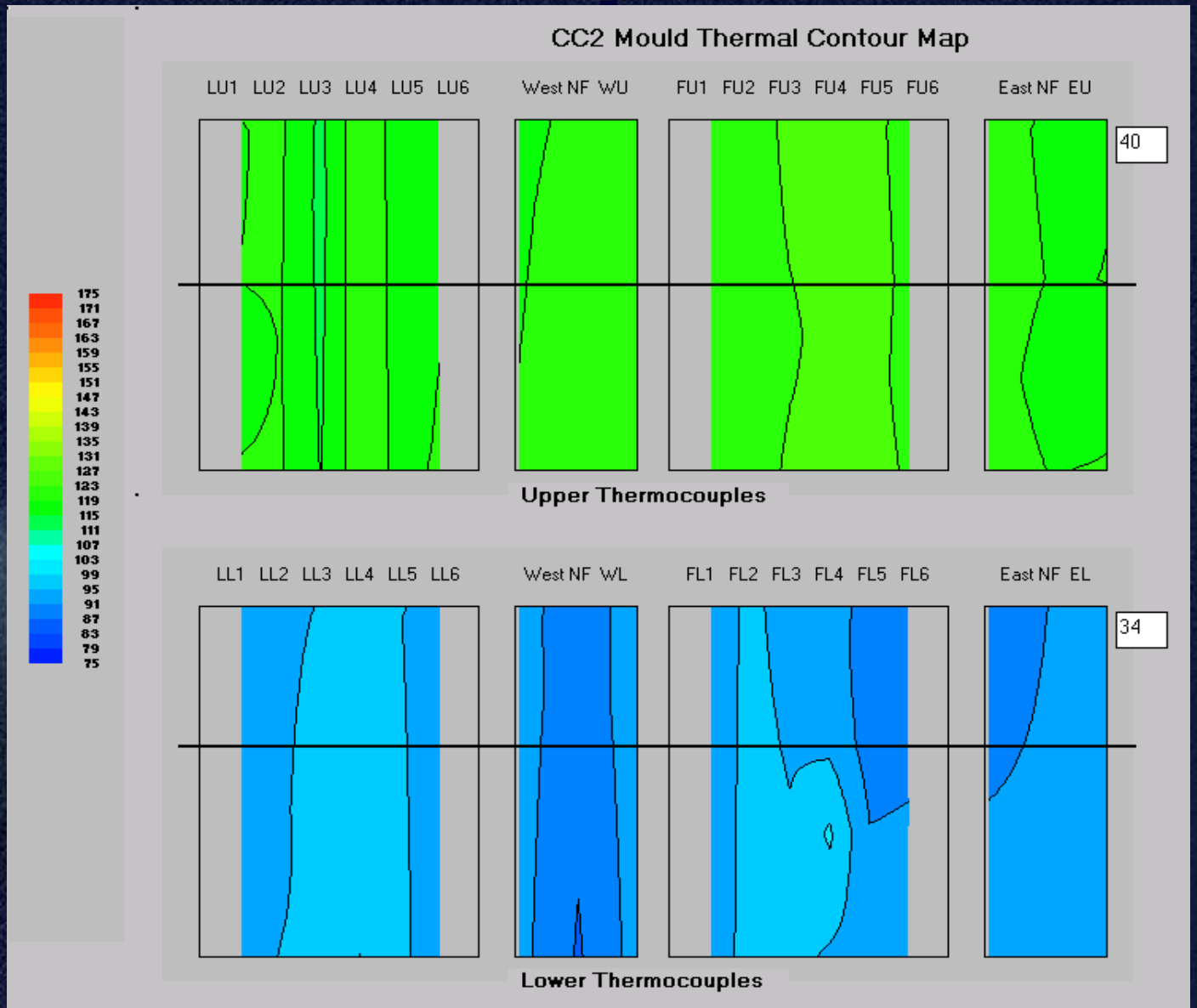
New Requirements

- Enhanced Visualization of data
  - Real-Time display with PI data
- Expand Monitoring System to include Transient Casting Conditions
  - PI as an integral component
- Enhanced Supporting Analysis Utilities
  - Analyzes large PI archive data set

Agenda

- Introduction
  - Caster SOS™ and New Requirements
- System Enhancements
  - Visualization
  - Expanded Monitoring
  - Historical Support Utilities
- Summary

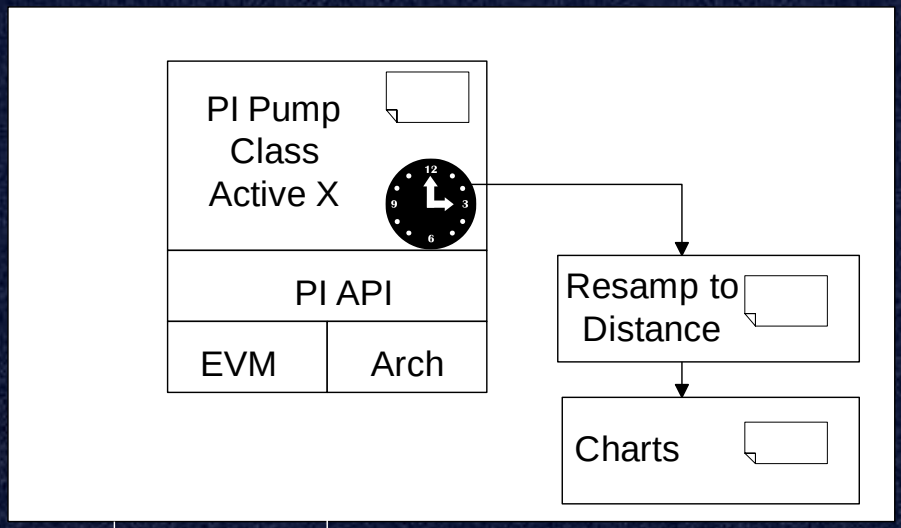
Thermal Map


CC2 Mould Thermal Contour Map
LU1 LU2 LU3 LU4 LU5 LU6
West NF WU
FU1 FU2 FU3 FU4 FU5 FU6
East NF EU
40
175
171
167
163
159
155
151
147
143
139
135
131
127
123
119
115
111
107
103
99
95
91
87
83
79
75
Upper Thermocouples
LL1 LL2 LL3 LL4 LL5 LL6
West NF WL
FL1 FL2 FL3 FL4 FL5 FL6
East NF EL
34
Lower Thermocouples

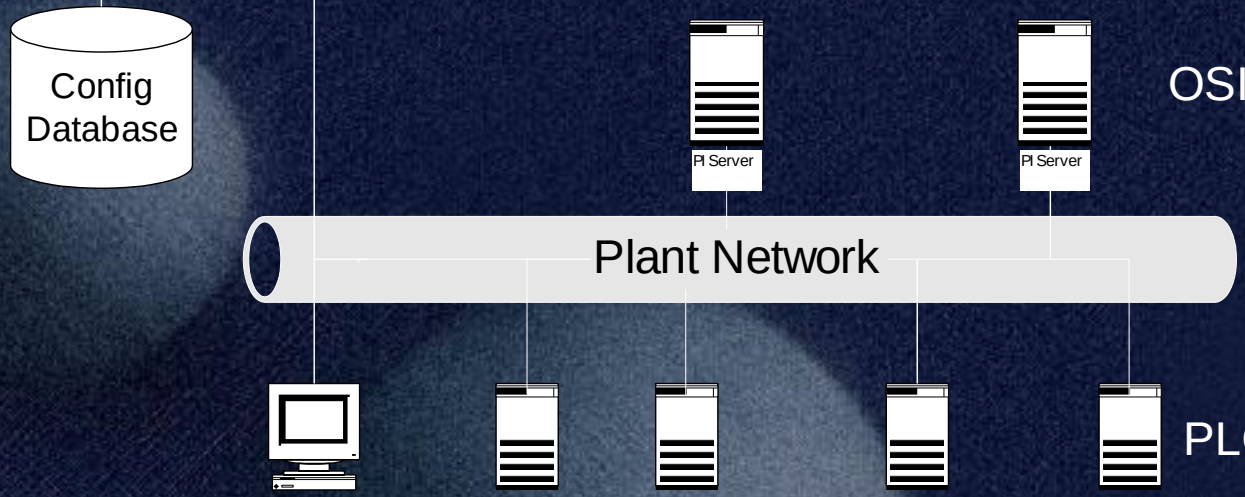
Thermal Map

- Purpose: provide the operators with an enhanced view of the thermocouple data so that it can be used to help diagnose Caster SOS^{TM} alarms

Thermal Map

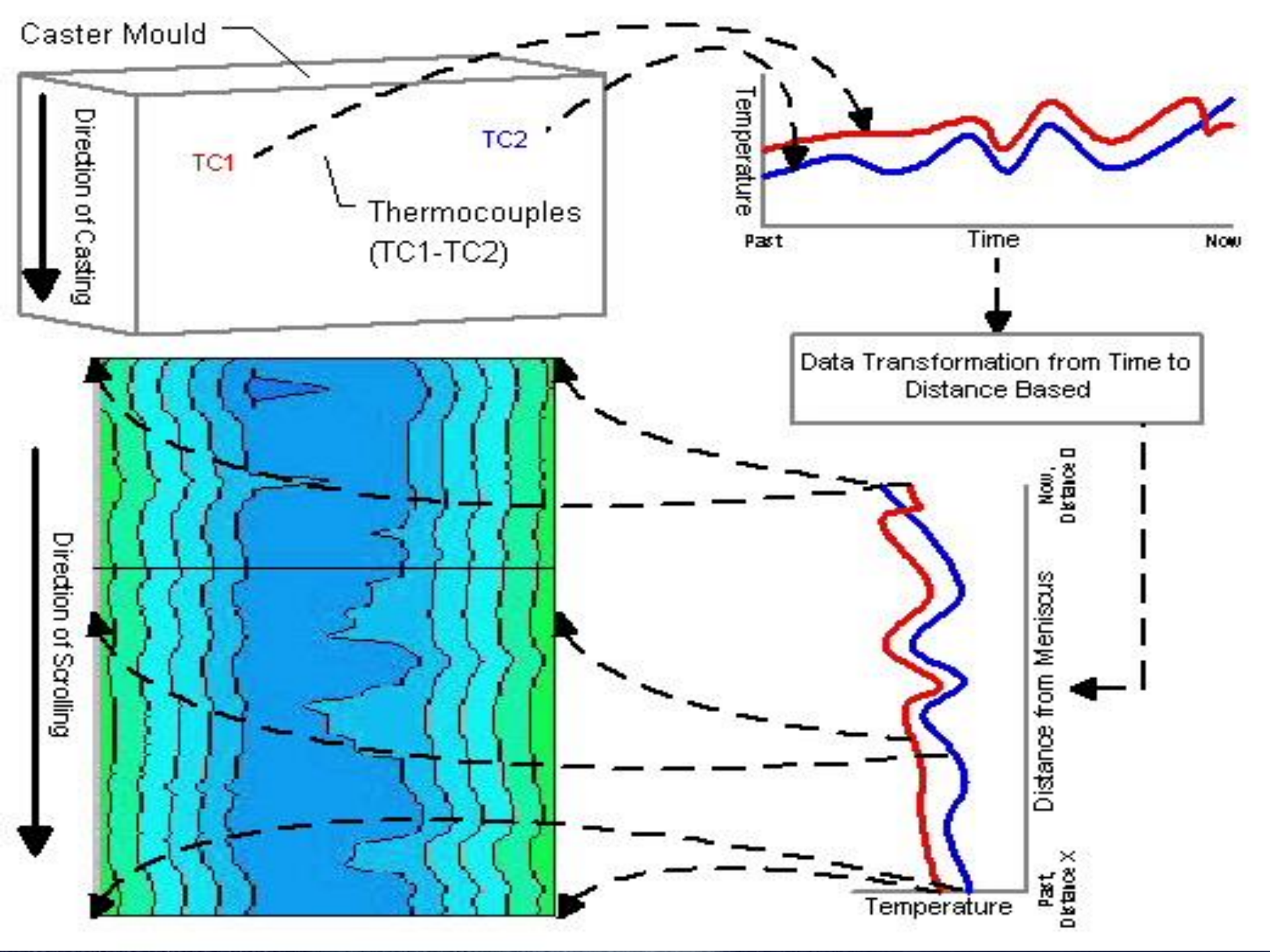


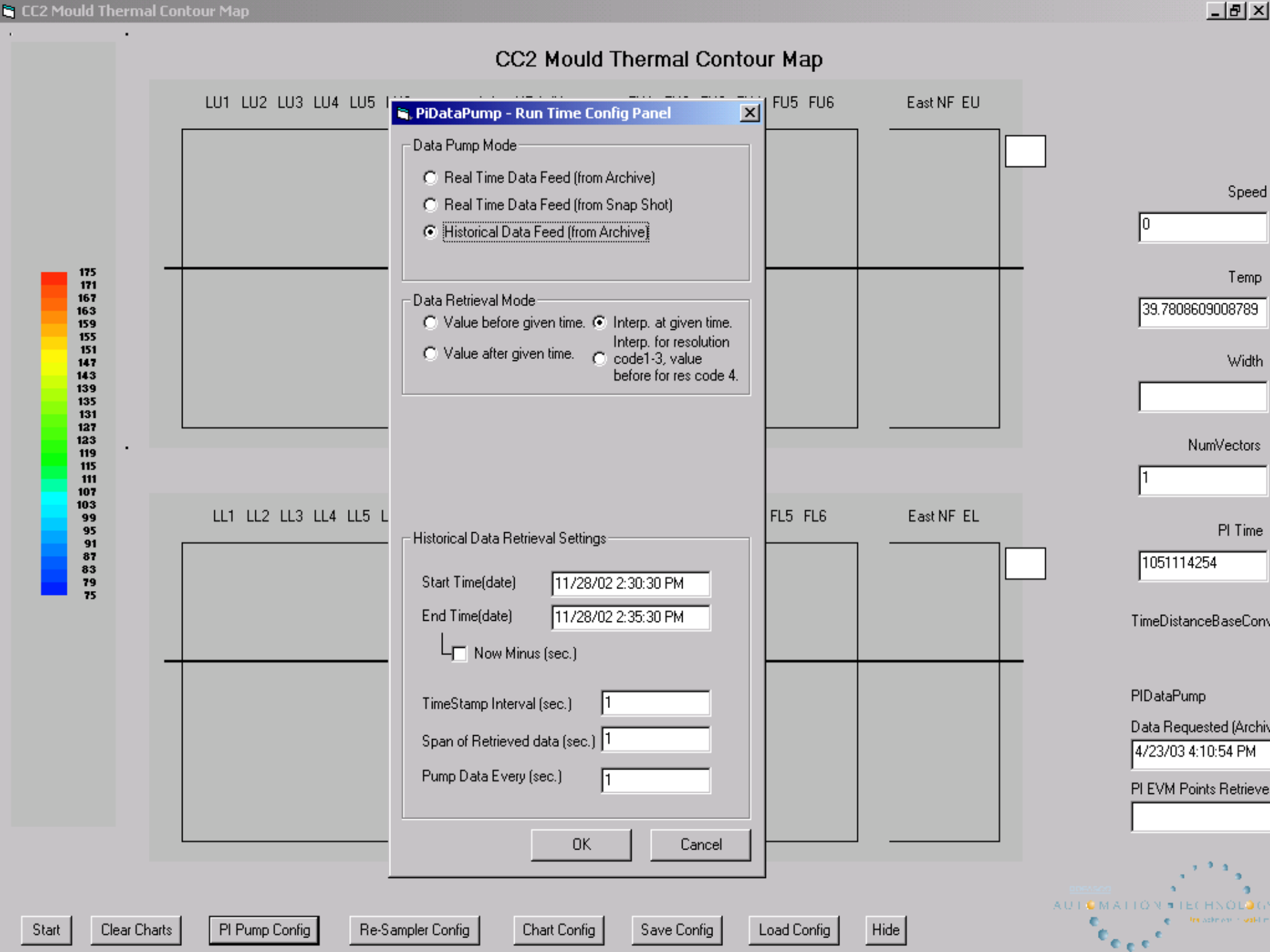
Thermal MAP



OSI PI Servers

PLC & DCS


Caster Mould
Direction of Casting
TC1
TC2
Thermocouples
(TC1-TC2)
Temperature
Past
Time
Now
Data Transformation from Time to Distance Based
Direction of Scrolling
Distance from Menisous
Temperature


CC2 Mould Thermal Contour Map
LU1 LU2 LU3 LU4 LU5
FU5 FU6
East NF EU
LL1 LL2 LL3 LL4 LL5
FL5 FL6
East NF EL
175
171
167
163
159
155
151
147
143
139
135
131
127
123
119
115
111
107
103
99
95
91
87
83
79
75
PiDataPump - Run Time Config Panel
Data Pump Mode
Real Time Data Feed (from Archive)
Real Time Data Feed (from Snap Shot)
Historical Data Feed (from Archive)
Data Retrieval Mode
Value before given time.
Interp. at given time.
Value after given time.
Interp. for resolution code1-3, value before for res code 4.
Historical Data Retrieval Settings
Start Time(date)
11/28/02 2:30:30 PM
End Time(date)
11/28/02 2:35:30 PM
Now Minus (sec.)
TimeStamp Interval (sec.)
1
Span of Retrieved data (sec.)
1
Pump Data Every (sec.)
1
OK
Cancel
Speed
0
Temp
39.7808609008789
Width
NumVectors
1
PI Time
1051114254
TimeDistanceBaseConv
PIDataPump
Data Requested (Archiv
4/23/03 4:10:54 PM
PI EVM Points Retrieve
Start
Clear Charts
PI Pump Config
Re-Sampler Config
Chart Config
Save Config
Load Config
Hide

Thermal Map

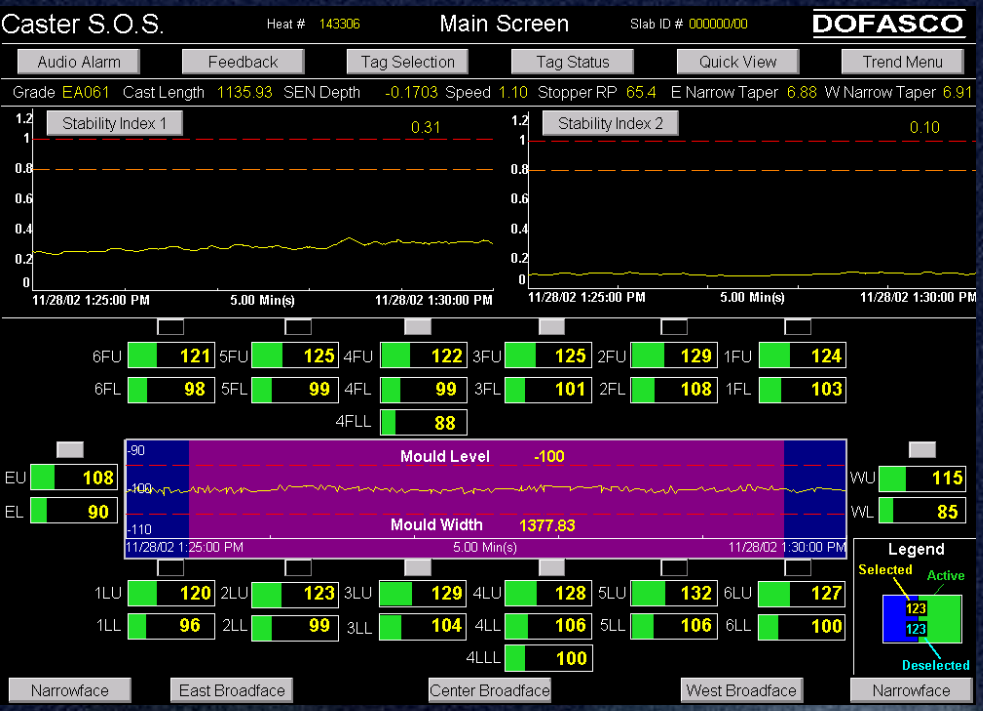
Benefits

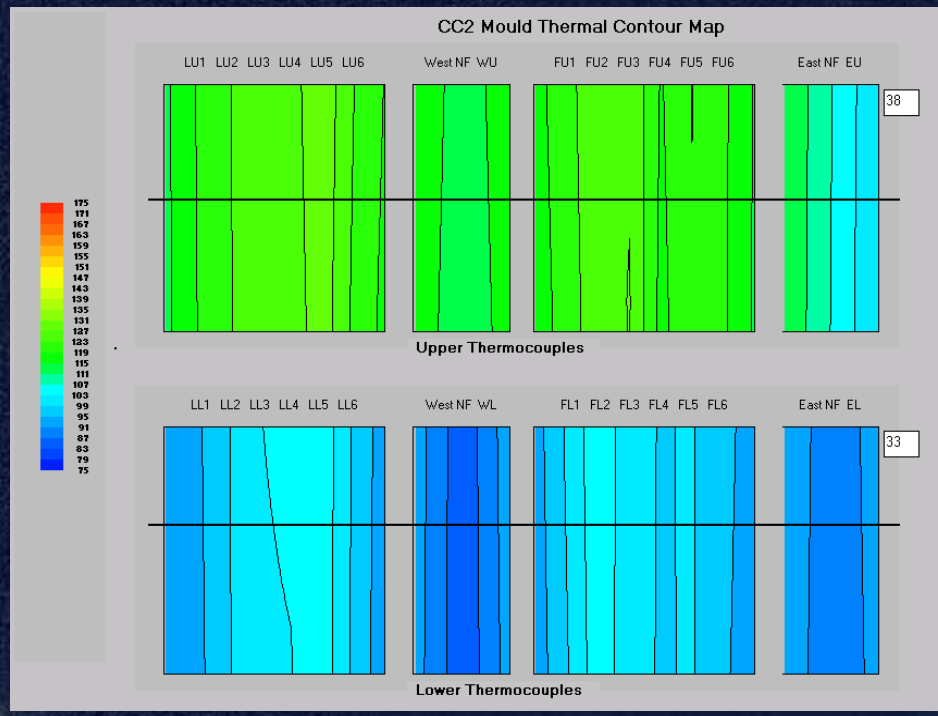
- Temporal and spatial visualization of the data
- Operator able to see hot and cold spots in the mould
- Operator able to diagnose Caster SOS^{TM} alarms based on thermal map display

Case Study #1

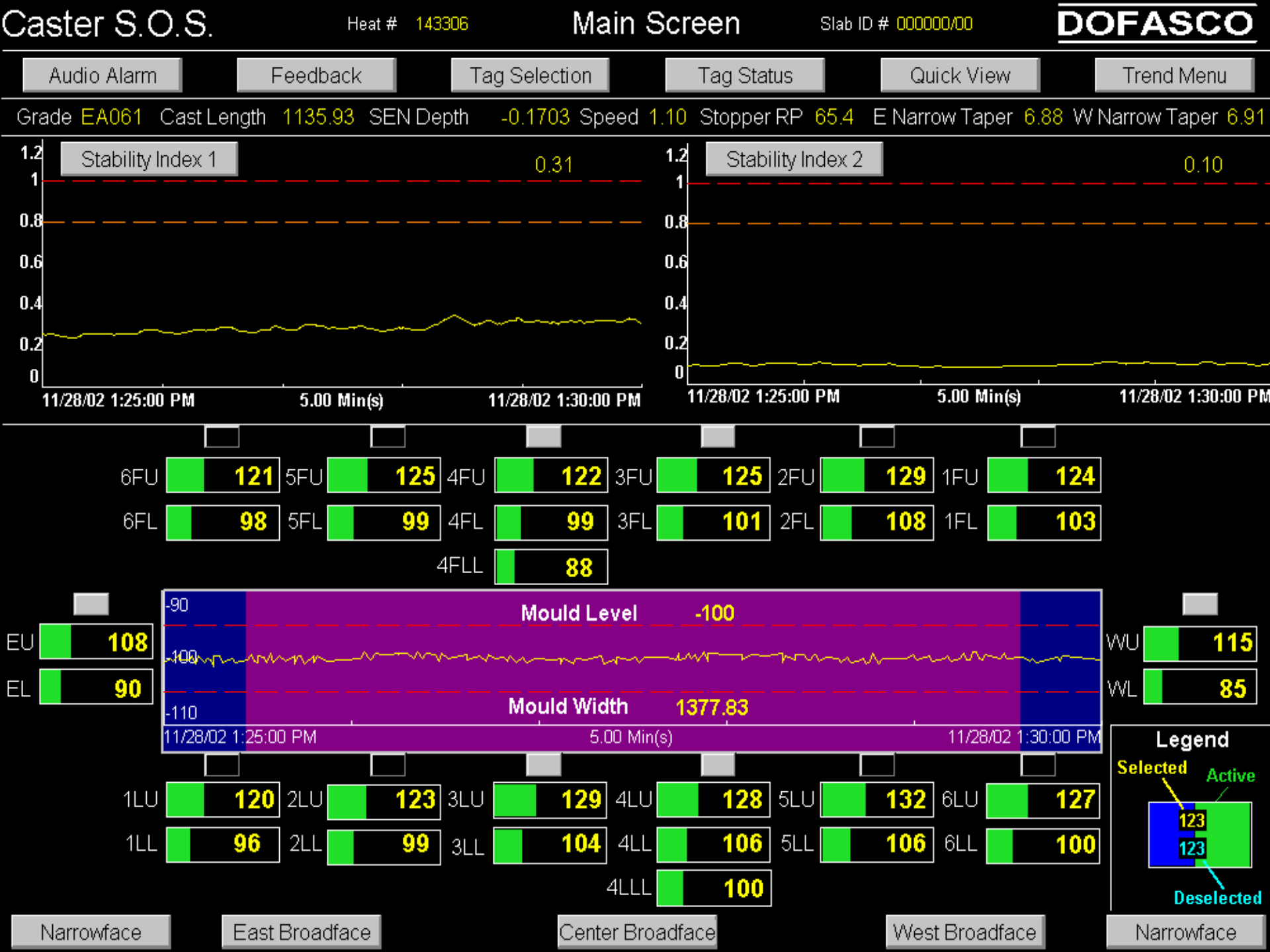
- Caster SOS^{TM} and Thermal Map identified formation of a sticker in the mould
- Thermal Map not commissioned for the event
- Sticker Breakout Occurred

Example 1

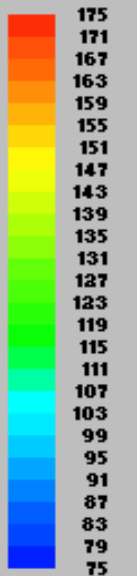


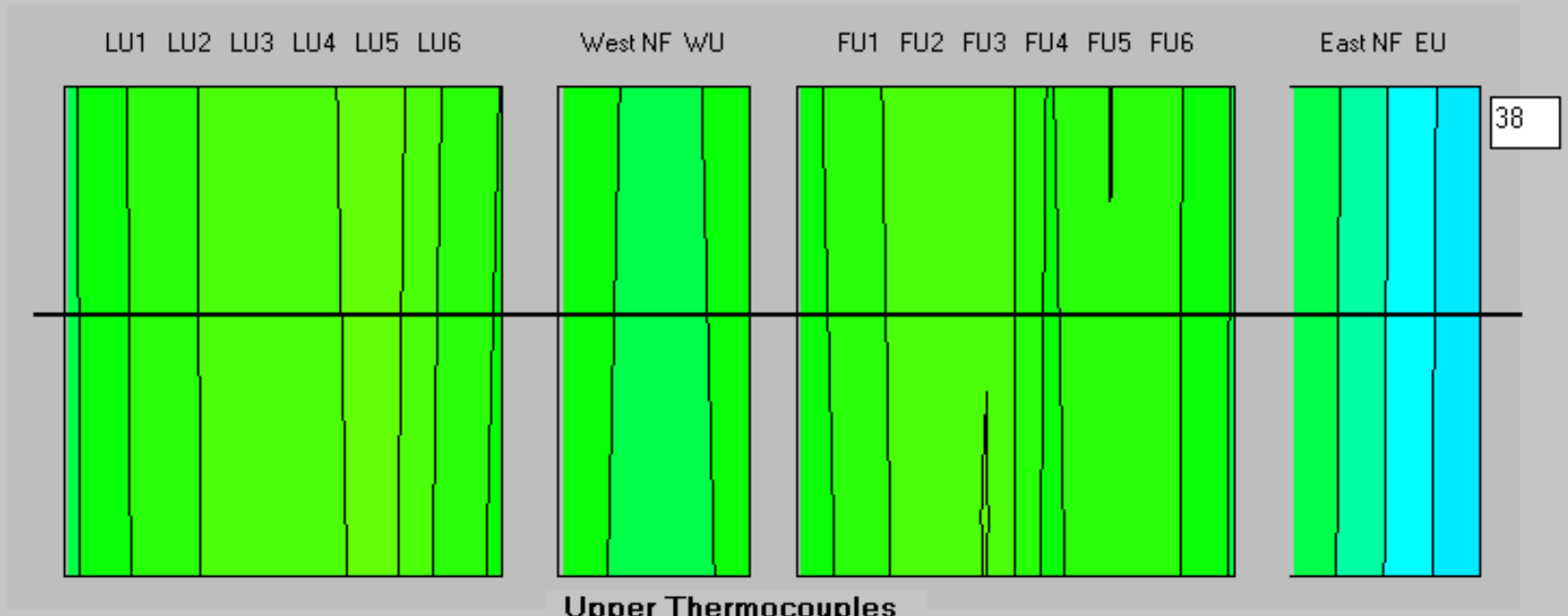


DOFASCO AUTOMATION + TECHNOLOGY

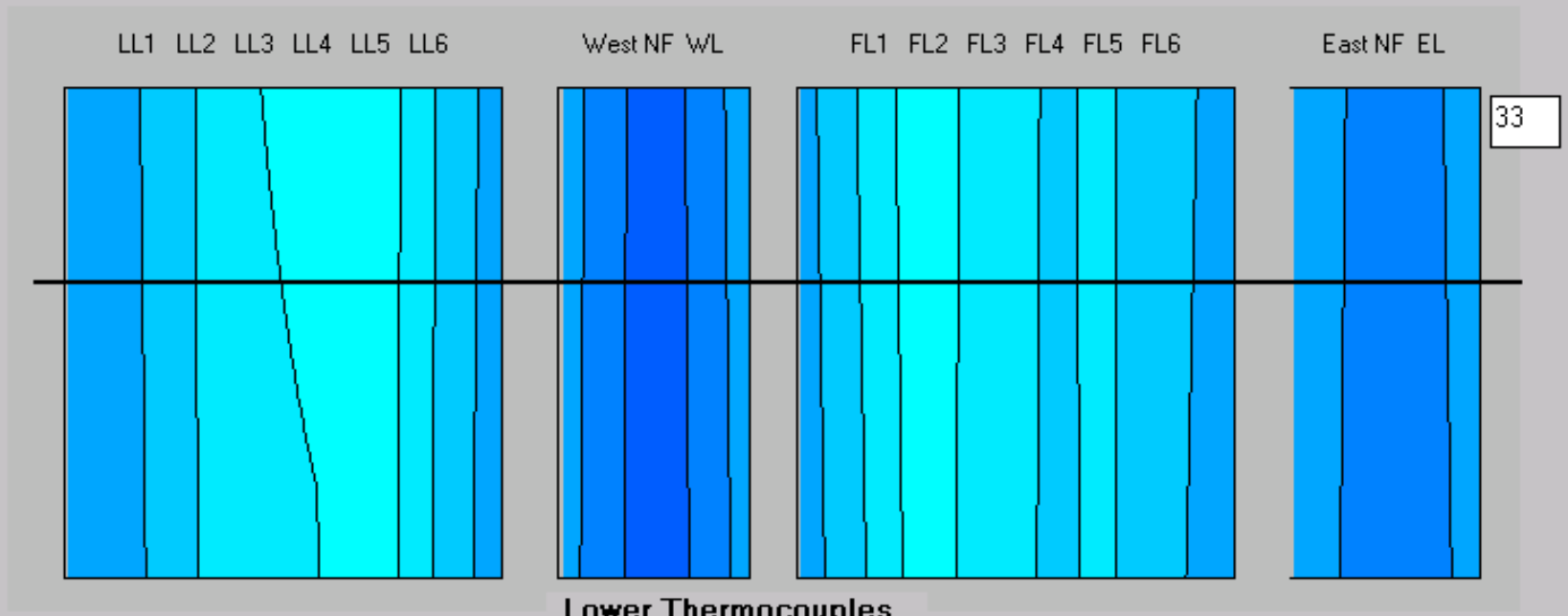

Caster S.O.S.
Heat # 143306
Main Screen
Slab ID # 000000/00
DOFASCO
Audio Alarm
Feedback
Tag Selection
Tag Status
Quick View
Trend Menu
Grade EA061 Cast Length 1135.93 SEN Depth -0.1703 Speed 1.10 Stopper RP 65.4 E Narrow Taper 6.88 W Narrow Taper 6.91
Stability Index 1
0.31
1.2
1
0.8
0.6
0.4
0.2
0
11/28/02 1:25:00 PM
5.00 Min(s)
11/28/02 1:30:00 PM
Stability Index 2
0.10
1.2
1
0.8
0.6
0.4
0.2
0
11/28/02 1:25:00 PM
5.00 Min(s)
11/28/02 1:30:00 PM
6FU 121
5FU 125
4FU 122
3FU 125
2FU 129
1FU 124
6FL 98
5FL 99
4FL 99
3FL 101
2FL 108
1FL 103
4FLL 88
EU 108
EL 90
-90
Mould Level -100
-100
Mould Width 1377.83
-110
11/28/02 1:25:00 PM
5.00 Min(s)
11/28/02 1:30:00 PM
WU 115
WL 85
1LU 120
2LU 123
3LU 129
4LU 128
5LU 132
6LU 127
1LL 96
2LL 99
3LL 104
4LL 106
5LL 106
6LL 100
4LLL 100
Legend
Selected
Active
123
123
Deselected
Narrowface
East Broadface
Center Broadface
West Broadface
Narrowface

CC2 Mould Thermal Contour Map





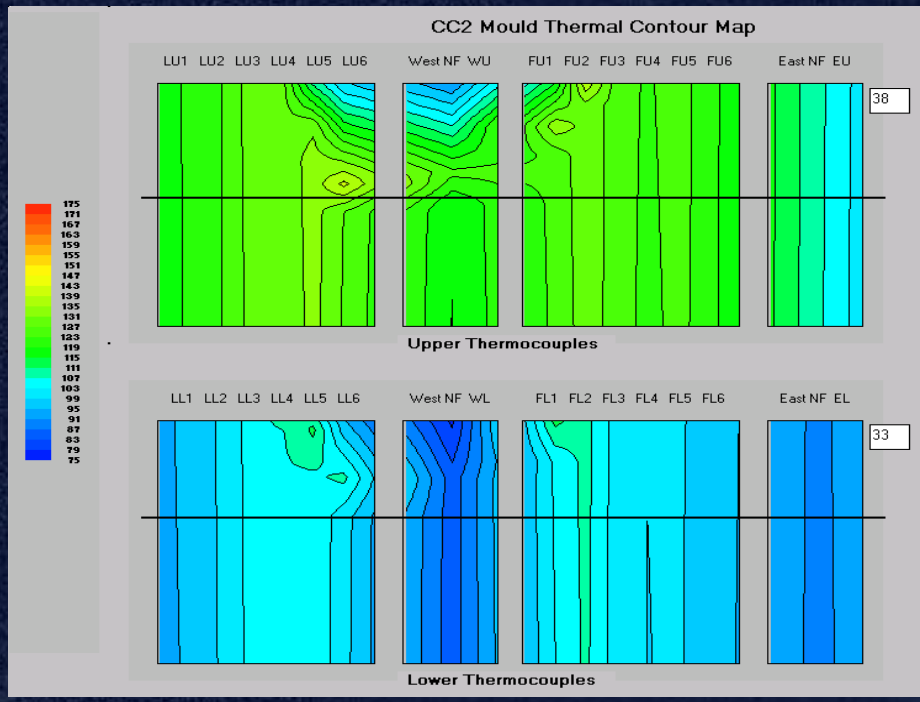
Upper Thermocouples



Lower Thermocouples

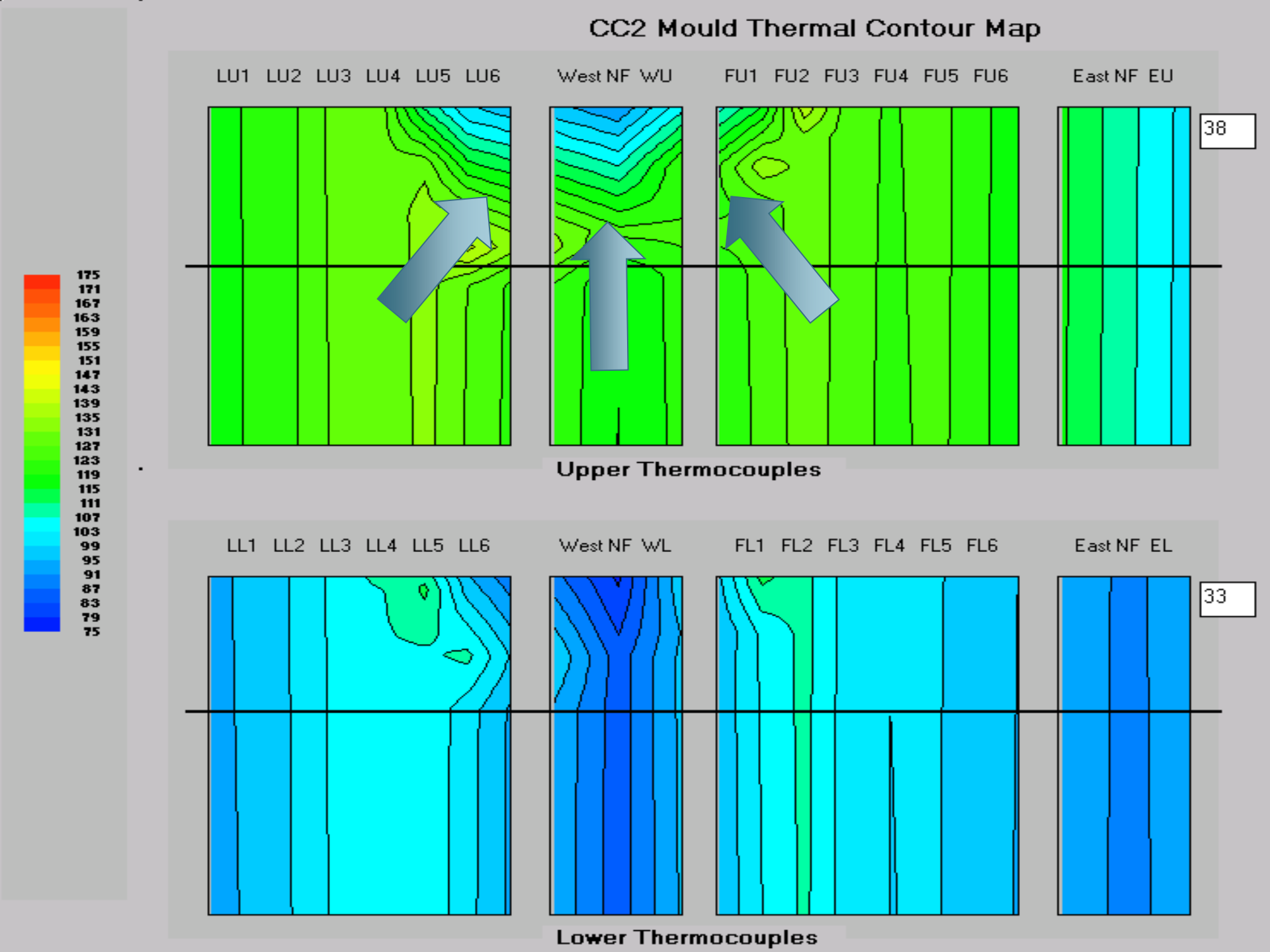
Example 1


Caster S.O.S.
Heat # 140261
Main Screen
Slab ID # No Data
DOFASCO
Audio Alarm
Feedback
Tag Selection
Tag Status
Quick View
Trend Menu
Grade No Data Cast Length 1137.07 SEN Depth -0.1702 Speed 1.10 Stopper RP 65.4 E Narrow Taper 6.88 W Narrow Taper 6.91
Stability Index 1
1.29
Stability Index 2
0.51
11/28/02 1:26:05 PM
5.00 Min(s)
11/28/02 1:31:05 PM
6FU 121 5FU 125 4FU 122 3FU 125 2FU 138 1FU 115
6FL 98 5FL 99 4FL 99 3FL 101 2FL 108 1FL 112
4FLL 88
Mould Level -100
Mould Width 1377.82
EU 108
EL 90
WU 91
WL 78
1LU 120 2LU 123 3LU 129 4LU 128 5LU 110 6LU 99
1LL 96 2LL 100 3LL 105 4LL 109 5LL 109 6LL 95
4LLL 100
Legend
Selected
Active
Deselected
Narrowface
East Broadface
Center Broadface
West Broadface
Narrowface


CC2 Mould Thermal Contour Map
LU1 LU2 LU3 LU4 LU5 LU6
West NF WU
FU1 FU2 FU3 FU4 FU5 FU6
East NF EU
38
Upper Thermocouples
LL1 LL2 LL3 LL4 LL5 LL6
West NF WL
FL1 FL2 FL3 FL4 FL5 FL6
East NF EL
33
Lower Thermocouples

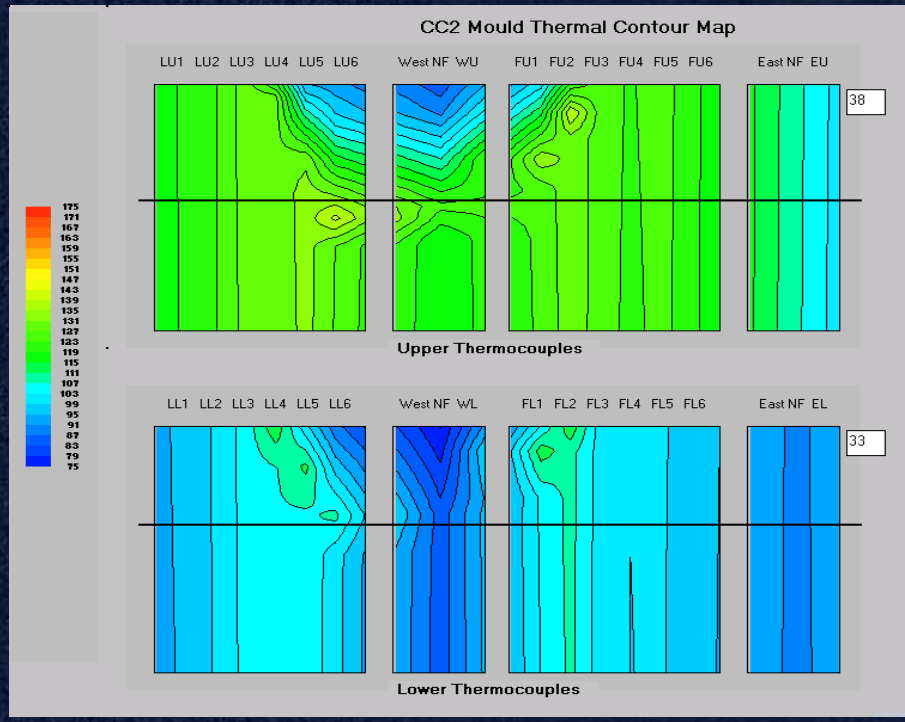

Caster S.O.S.
Heat # 140261
Main Screen
Slab ID # No Data
DOFASCO
Audio Alarm
Feedback
Tag Selection
Tag Status
Quick View
Trend Menu
Grade No Data Cast Length 1137.07 SEN Depth -0.1702 Speed 1.10 Stopper RP 65.4 E Narrow Taper 6.88 W Narrow Taper 6.91
Stability Index 1
1.29
1.2
1
0.8
0.6
0.4
0.2
0
11/28/02 1:26:05 PM
5.00 Min(s)
11/28/02 1:31:05 PM
Stability Index 2
0.51
1.2
1
0.8
0.6
0.4
0.2
0
11/28/02 1:26:05 PM
5.00 Min(s)
11/28/02 1:31:05 PM
6FU 121
5FU 125
4FU 122
3FU 125
2FU 138
1FU 115
6FL 98
5FL 99
4FL 99
3FL 101
2FL 108
1FL 112
4FLL 88
EU 108
EL 90
-90
Mould Level -100
-100
-110
Mould Width 1377.82
11/28/02 1:26:05 PM
5.00 Min(s)
11/28/02 1:31:05 PM
WU 91
WL 78
1LU 120
2LU 123
3LU 129
4LU 128
5LU 110
6LU 99
1LL 96
2LL 100
3LL 105
4LL 109
5LL 109
6LL 95
4LLL 100
Legend
Selected
Active
123
123
Deselected
Narrowface
East Broadface
Center Broadface
West Broadface
Narrowface

CC2 Mould Thermal Contour Map



Example 1

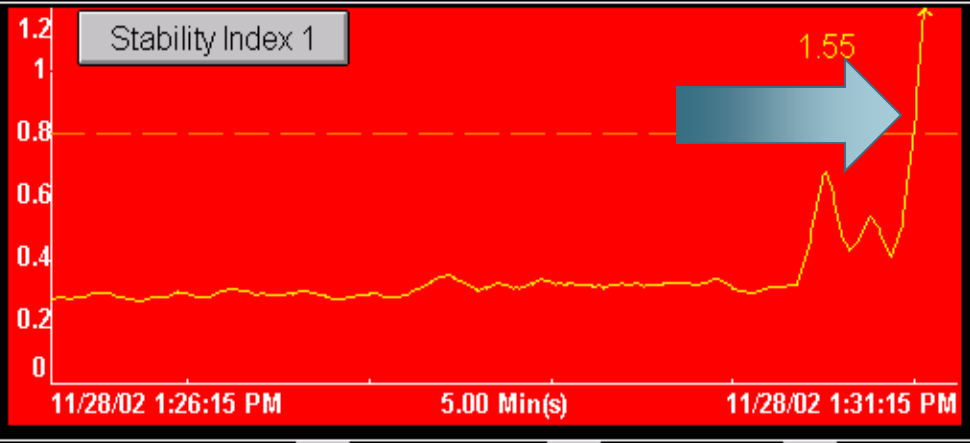

Caster S.O.S.
Heat # 140261
Main Screen
Slab ID # No Data
DOFASCO
Audio Alarm
Feedback
Tag Selection
Tag Status
Quick View
Trend Menu
Grade No Data Cast Length 1137.24 SEN Depth -0.1702 Speed 1.10 Stopper RP 65.4 E Narrow Taper 6.88 W Narrow Taper 6.91
Stability Index 1
1.55
Stability Index 2
0.86
11/28/02 1:26:15 PM
5.00 Min(s)
11/28/02 1:31:15 PM
6FU 121 5FU 125 4FU 123 3FU 125 2FU 120 1FU 101
6FL 98 5FL 99 4FL 99 3FL 101 2FL 114 1FL 103
4FLL 88
EU 108
EL 90
Mould Level -100
Mould Width 1377.82
WU 85
WL 75
Legend
Selected
Active
Deselected
1LU 120 2LU 123 3LU 129 4LU 120 5LU 95 6LU 93
1LL 96 2LL 100 3LL 105 4LL 114 5LL 100 6LL 88
4LLL 101
Narrowface
East Broadface
Center Broadface
West Broadface
Narrowface

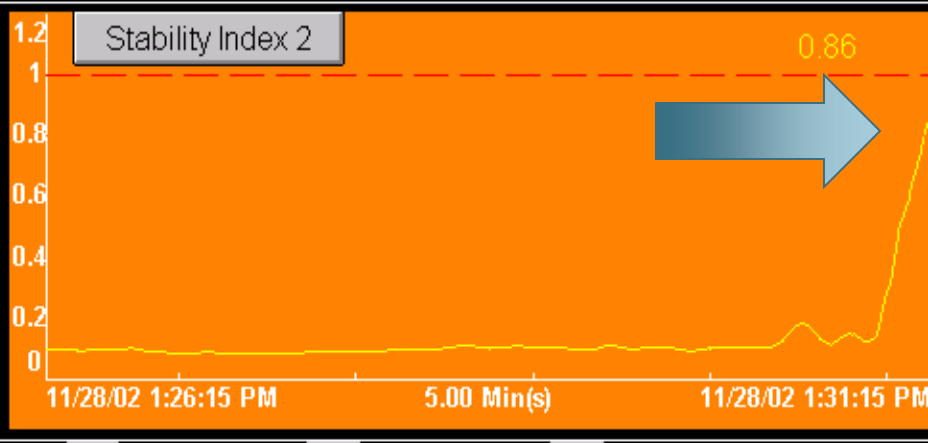

CC2 Mould Thermal Contour Map
LU1 LU2 LU3 LU4 LU5 LU6
West NF WU
FU1 FU2 FU3 FU4 FU5 FU6
East NF EU
38
Upper Thermocouples
LL1 LL2 LL3 LL4 LL5 LL6
West NF WL
FL1 FL2 FL3 FL4 FL5 FL6
East NF EL
33
Lower Thermocouples

Caster S.O.S. Heat # 140261 Main Screen Slab ID # No Data DOFASCO

Audio Alarm | Feedback | Tag Selection | Tag Status | Quick View | Trend Menu

Grade No Data Cast Length 1137.24 SEN Depth -0.1702 Speed 1.10 Stopper RP 65.4 E Narrow Taper 6.88 W Narrow Taper 6.91



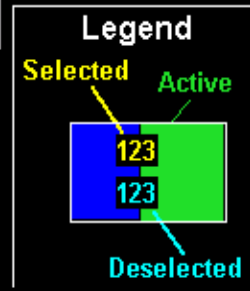


6FU	121	5FU	125	4FU	123	3FU	125	2FU	120	1FU	101
6FL	98	5FL	99	4FL	99	3FL	101	2FL	114	1FL	103
				4FLL	88						

EU 108
EL 90

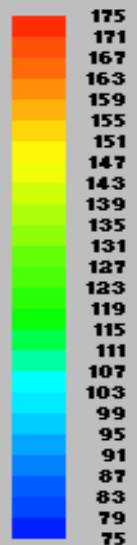
WU 85
WL 75

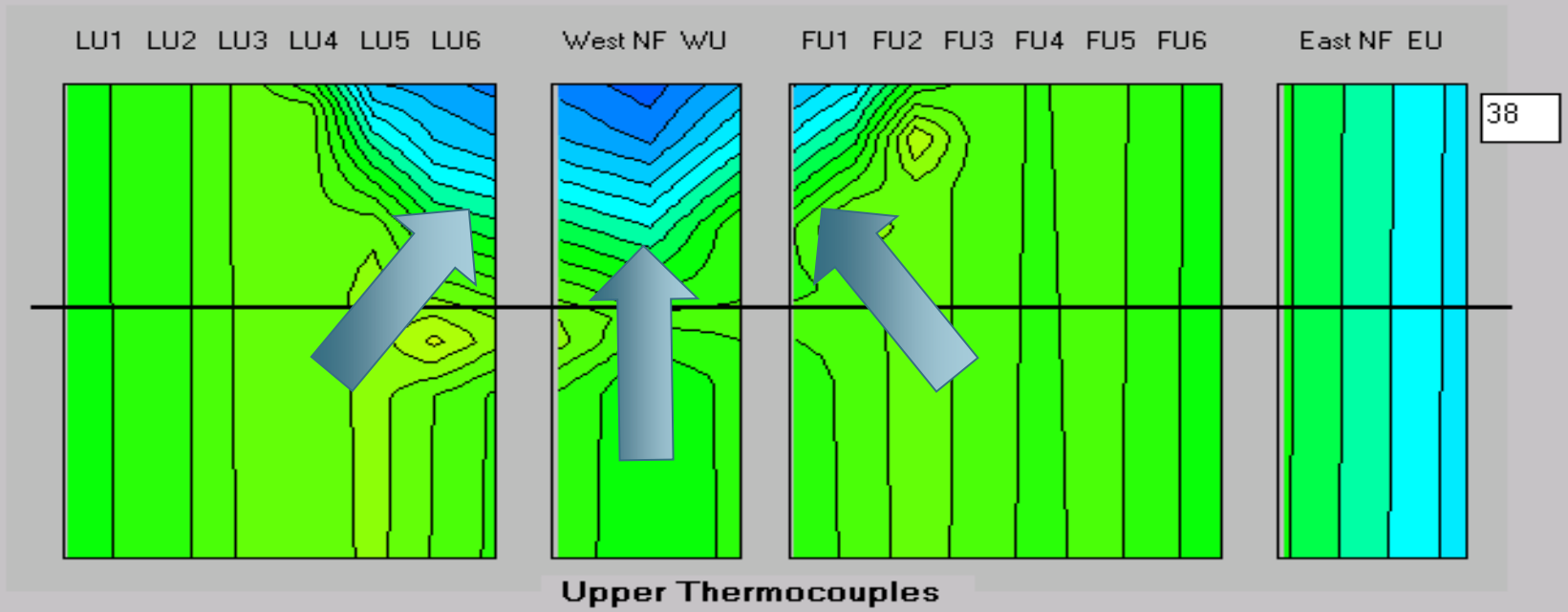
1LU	120	2LU	123	3LU	129	4LU	120	5LU	95	6LU	93
1LL	96	2LL	100	3LL	105	4LL	114	5LL	100	6LL	88
						4LLL	101				



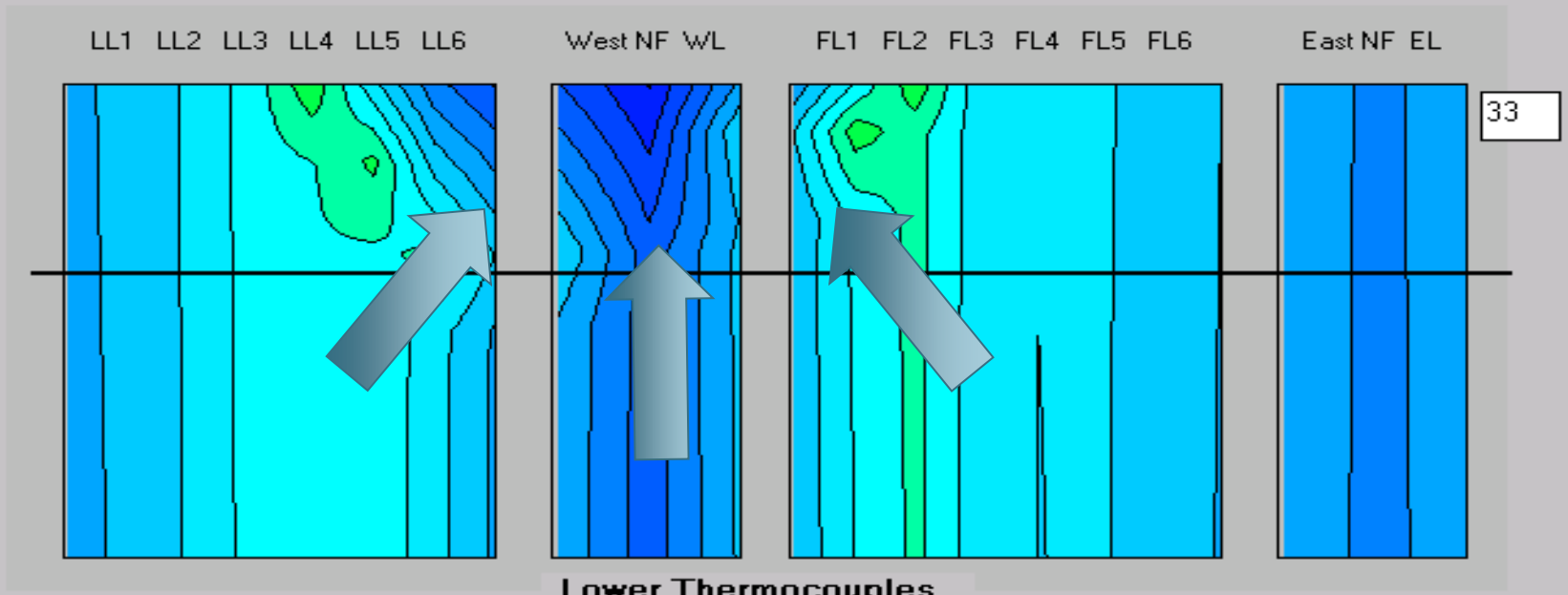
Narrowface | East Broadface | Center Broadface | West Broadface | Narrowface

CC2 Mould Thermal Contour Map





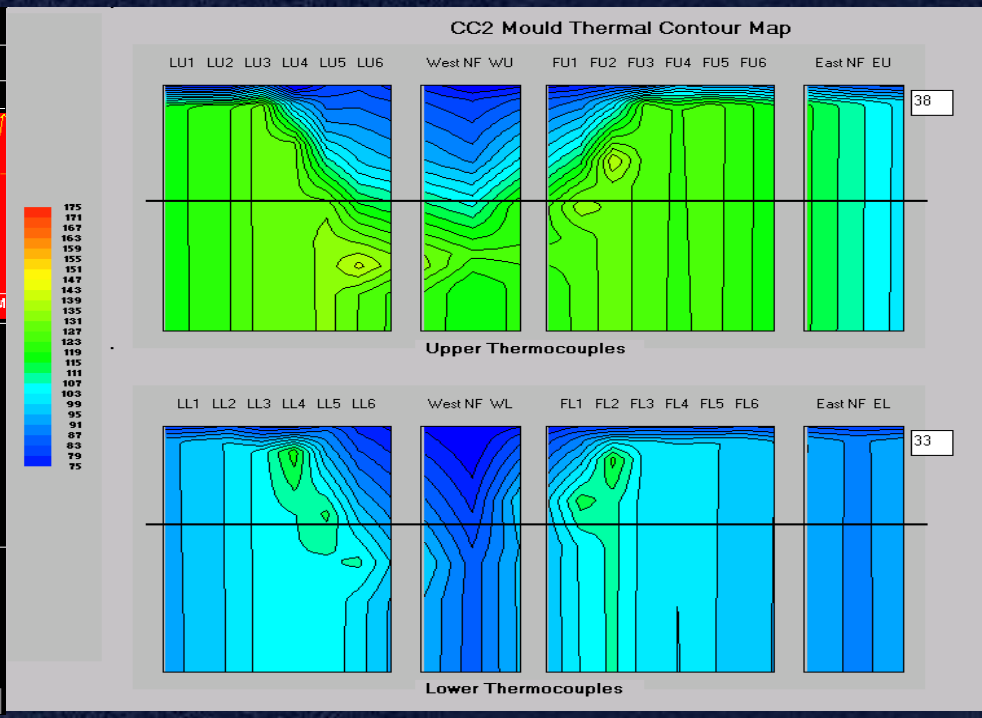
Upper Thermocouples



Lower Thermocouples

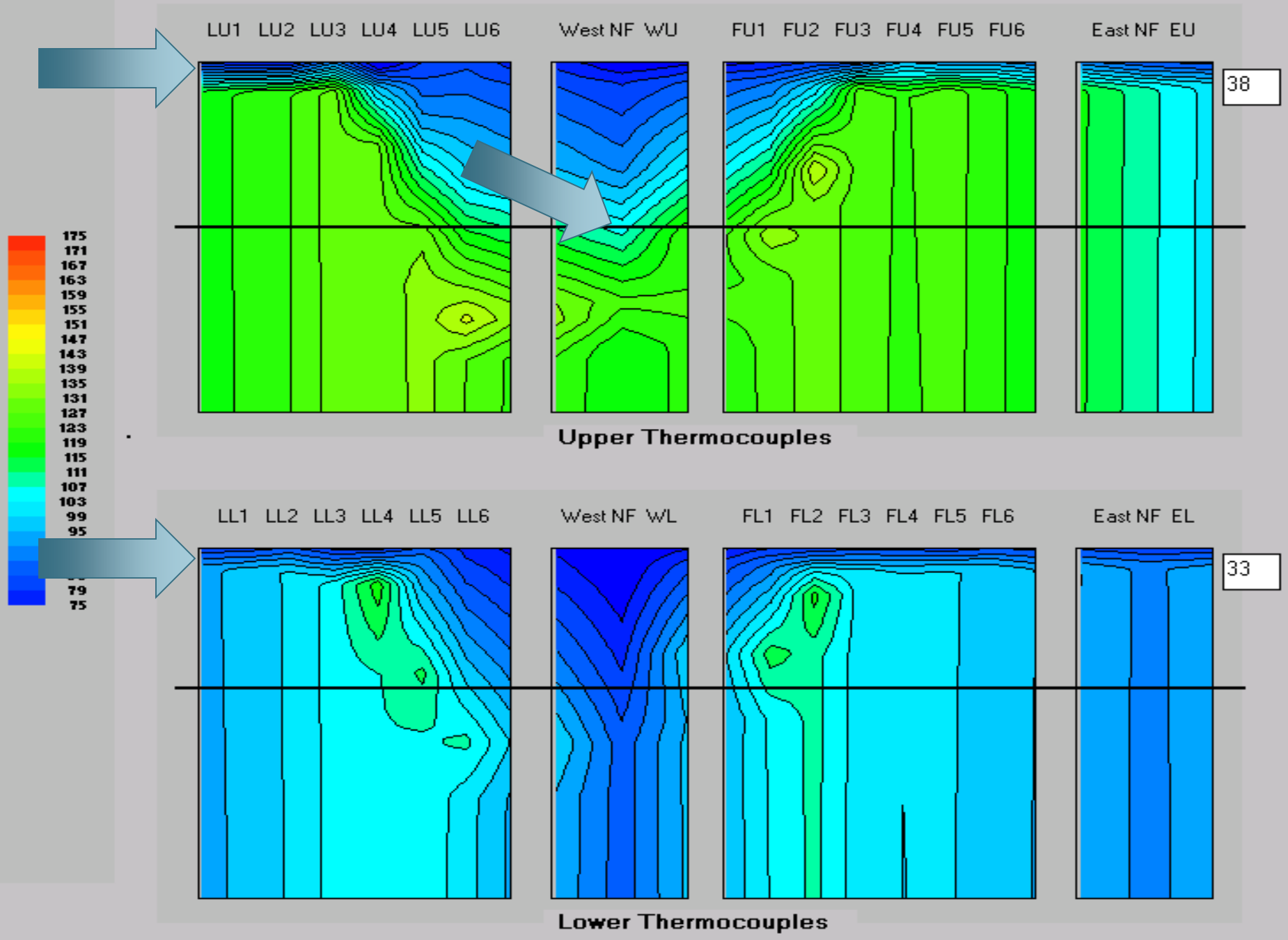
Example 1


Caster S.O.S.
Heat # 140261
Main Screen
Slab ID # No Data
DOFASCO
Audio Alarm
Feedback
Tag Selection
Tag Status
Quick View
Trend Menu
Grade No Data Cast Length 1137.40 SEN Depth -0.1702 Speed 1.10 Stopper RP 24.9 E Narrow Taper 6.88 W Narrow Taper 6.91
Stability Index 1
2.36
Stability Index 2
1.28
11/28/02 1:26:24 PM
5.00 Min(s)
11/28/02 1:31:24 PM
6FU 121 5FU 125 4FU 119 3FU 125 2FU 102 1FU 90
6FL 99 5FL 99 4FL 99 3FL 101 2FL 106 1FL 92
4FLL 88
EU 108
EL 90
Mould Level -150
Mould Width 1377.82
WU 80
WL 71
Legend
Selected
Active
Deselected
1LU 119 2LU 121 3LU 128 4LU 98 5LU 86 6LU 86
1LL 96 2LL 100 3LL 100 4LL 111 5LL 93 6LL 82
4LLL 101
Narrowface
East Broadface
Center Broadface
West Broadface
Narrowface


CC2 Mould Thermal Contour Map
LU1 LU2 LU3 LU4 LU5 LU6
West NF WU
FU1 FU2 FU3 FU4 FU5 FU6
East NF EU
38
Upper Thermocouples
LL1 LL2 LL3 LL4 LL5 LL6
West NF WL
FL1 FL2 FL3 FL4 FL5 FL6
East NF EL
33
Lower Thermocouples


Caster S.O.S.
Heat # 140261
Main Screen
Slab ID # No Data
DOFASCO
Audio Alarm
Feedback
Tag Selection
Tag Status
Quick View
Trend Menu
Grade No Data Cast Length 1137.40 SEN Depth -0.1702 Speed 1.10 Stopper RP 24.9 E Narrow Taper 6.88 W Narrow Taper 6.91
Stability Index 1
2.36
1.2
1
0.8
0.6
0.4
0.2
0
11/28/02 1:26:24 PM
5.00 Min(s)
11/28/02 1:31:24 PM
Stability Index 2
1.28
1.2
1
0.8
0.6
0.4
0.2
0
11/28/02 1:26:24 PM
5.00 Min(s)
11/28/02 1:31:24 PM
6FU 121
5FU 125
4FU 119
3FU 125
2FU 102
1FU 90
6FL 99
5FL 99
4FL 99
3FL 101
2FL 106
1FL 92
4FLL 88
EU 108
EL 90
-90
Mould Level -150
-100
-110
Mould Width 1377.82
11/28/02 1:26:24 PM
5.00 Min(s)
11/28/02 1:31:24 PM
WU 80
WL 71
1LU 119
2LU 121
3LU 128
4LU 98
5LU 86
6LU 86
1LL 96
2LL 100
3LL 100
4LL 111
5LL 93
6LL 82
4LLL 101
Legend
Selected
Active
123
123
Deselected
Narrowface
East Broadface
Center Broadface
West Broadface
Narrowface

CC2 Mould Thermal Contour Map



Agenda

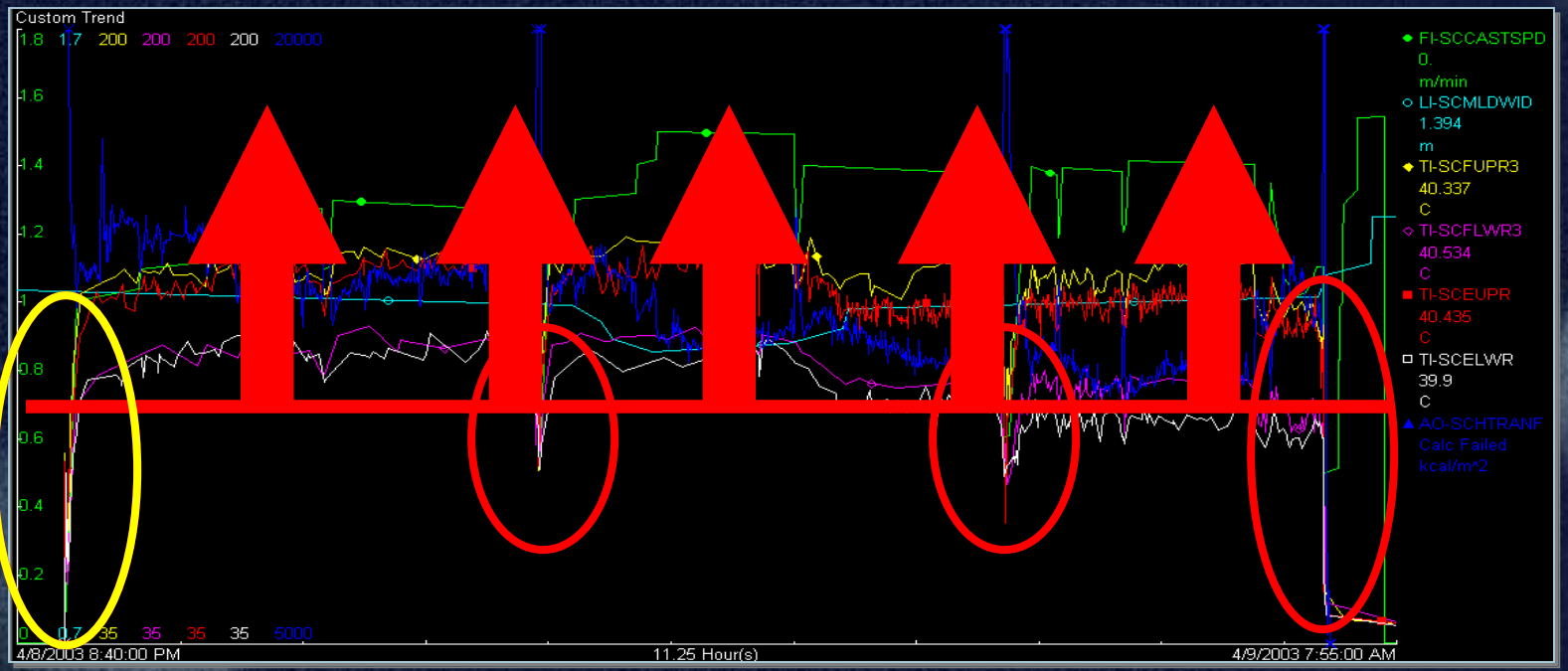
- Introduction
  - Caster SOS™ and New Requirements
- System Enhancements
  - Visualization
  - Expanded Monitoring
  - Historical Support Utilities
- Summary

Transient Caster Monitoring

- Start cast
- SEN change
- Tundish fly
- Plate insert

Transient Caster Monitoring

Steady State Casting



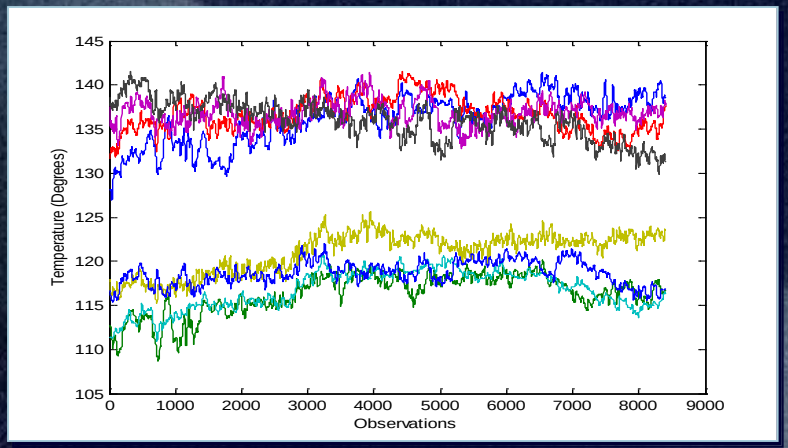
- *25% of breakouts found to be during start cast operation*

Start Cast Monitoring

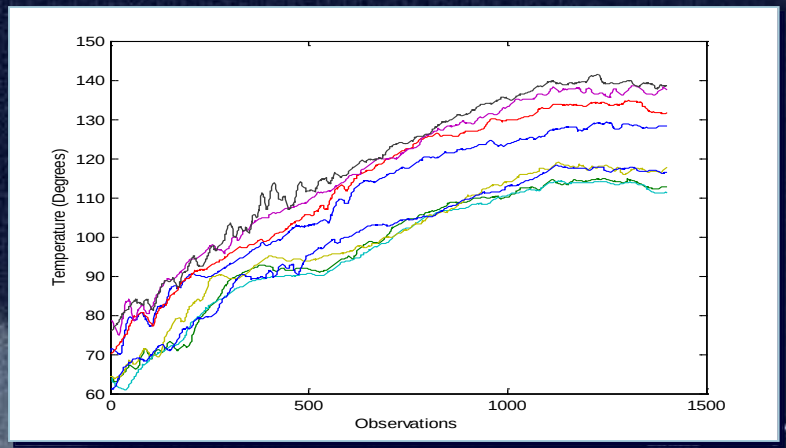
- Purpose: provide the operator with on-line monitoring of the start cast operation giving them a continuous indication of start cast stability

Nature of Batch/Start-up Processes

- Inherent characteristics in process data of batch or start-up processes
  - Dynamic (non-stationary)
  - Auto-correlated
  - In a finite duration

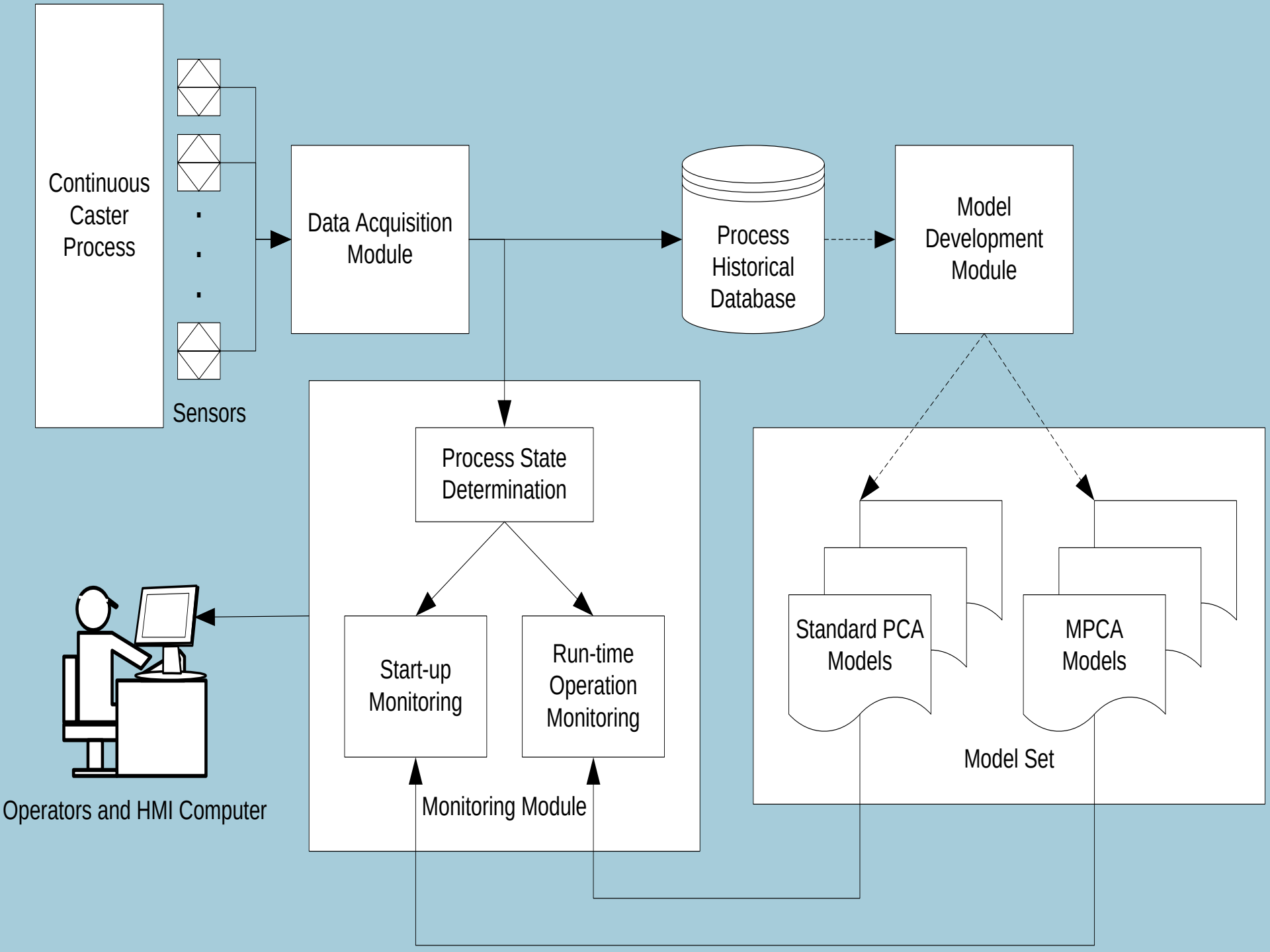


Continuous process

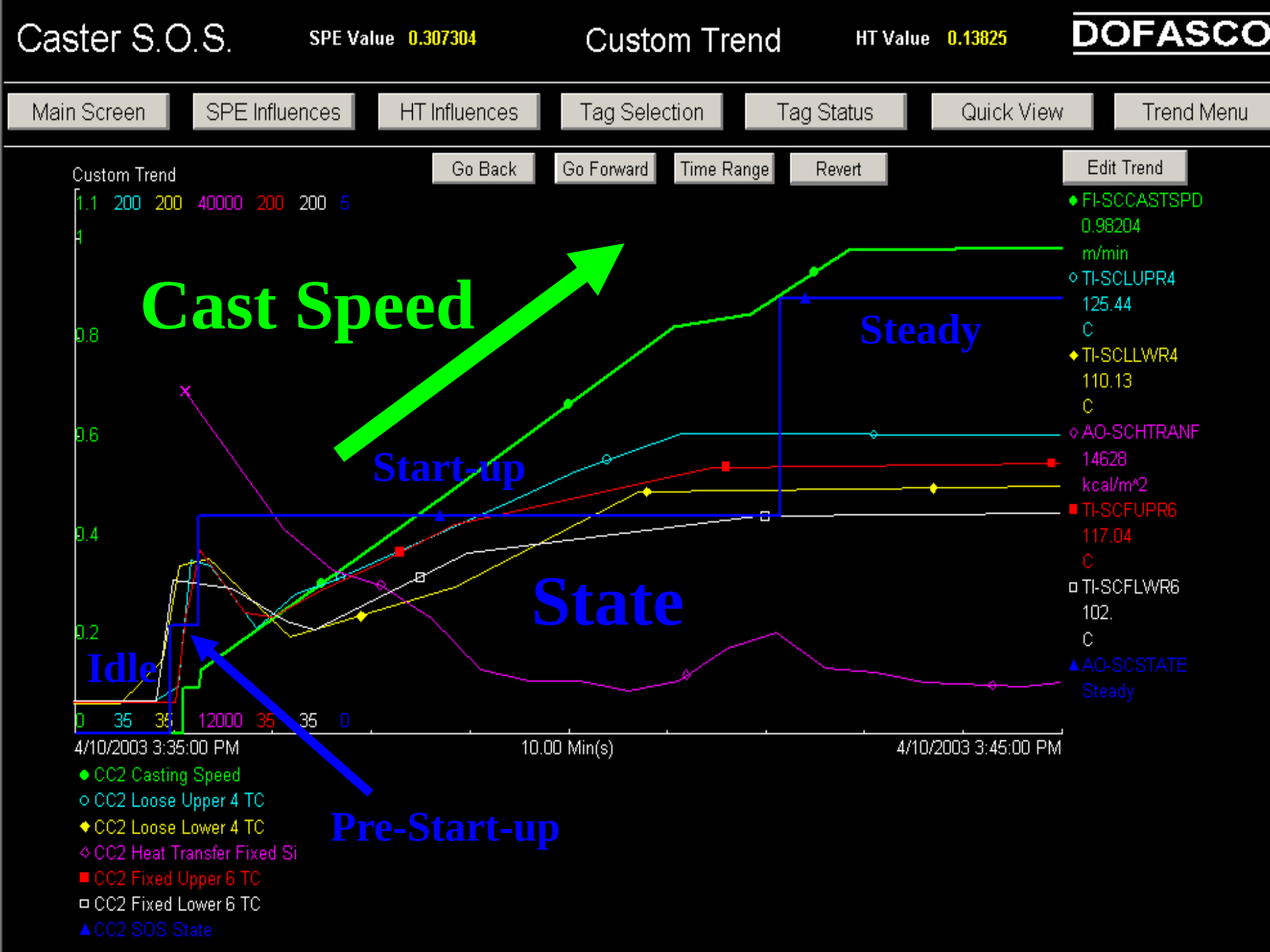


Batch/Start-up process

AUTOMATION + TECHNOLOGY

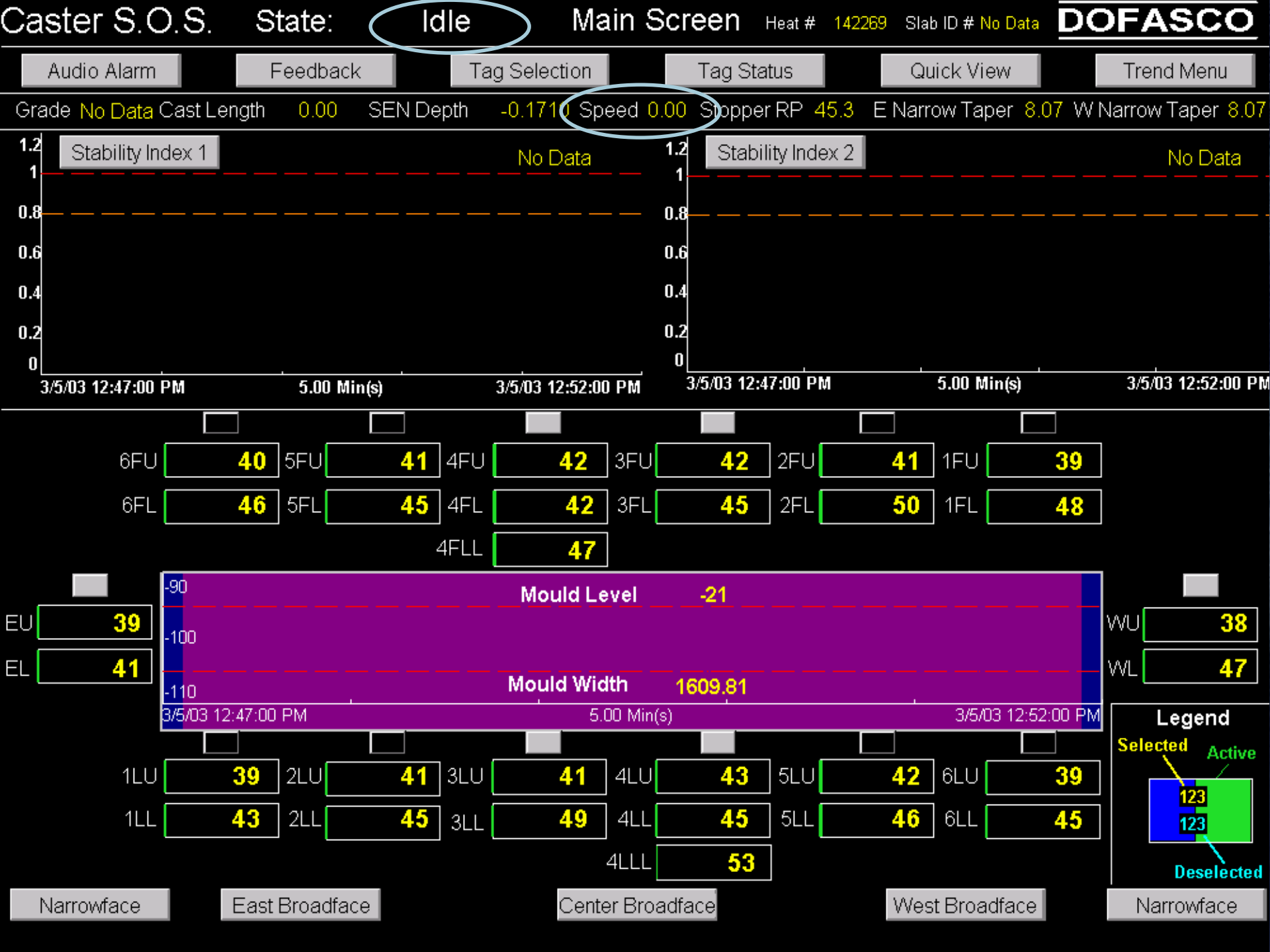

Continuous Caster Process
Sensors
Data Acquisition Module
Process Historical Database
Model Development Module
Process State Determination
Start-up Monitoring
Run-time Operation Monitoring
Monitoring Module
Standard PCA Models
MPCA Models
Model Set
Operators and HMI Computer

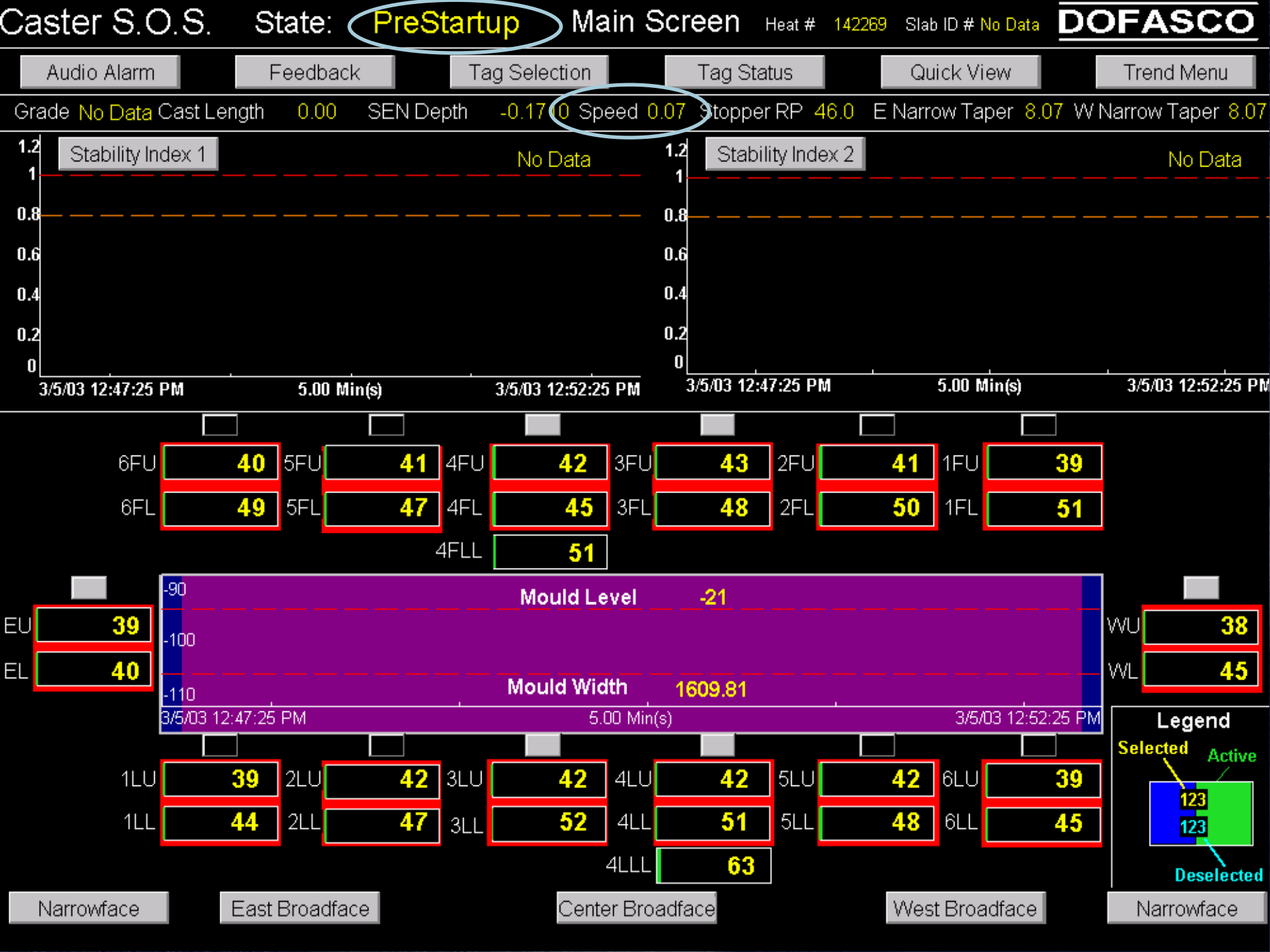
Start Cast Monitoring


Caster S.O.S.
SPE Value 0.307304
Custom Trend
HT Value 0.13825
DOFASCO
Main Screen
SPE Influences
HT Influences
Tag Selection
Tag Status
Quick View
Trend Menu
Go Back
Go Forward
Time Range
Revert
Edit Trend
Custom Trend
1.1 200 200 40000 200 200 5
1
0.8
0.6
0.4
0.2
0 35 35 12000 35 35 0
4/10/2003 3:35:00 PM
10.00 Min(s)
4/10/2003 3:45:00 PM
Cast Speed
Steady
Start-up
State
Idle
Pre-Start-up
FI-SCCASTSPD
0.98204
m/min
TI-SCLUPR4
125.44
C
TI-SCLLWR4
110.13
C
AO-SCHTRANF
14628
kcal/m^2
TI-SCFUPR6
117.04
C
TI-SCFLWR6
102.
C
AO-SCSTATE
Steady
CC2 Casting Speed
CC2 Loose Upper 4 TC
CC2 Loose Lower 4 TC
CC2 Heat Transfer Fixed Si
CC2 Fixed Upper 6 TC
CC2 Fixed Lower 6 TC
CC2 SOS State

Case Study #2

- System in background testing
- System alarms at the end of start cast
- Mould thermocouples abnormally inverted at end of start cast (abnormal)
- Could have lead to start cast breakout


Caster S.O.S.
State:
Idle
Main Screen
Heat # 142269
Slab ID # No Data
DOFASCO
Audio Alarm
Feedback
Tag Selection
Tag Status
Quick View
Trend Menu
Grade No Data Cast Length 0.00 SEN Depth -0.1710 Speed 0.00 Stopper RP 45.3 E Narrow Taper 8.07 W Narrow Taper 8.07
Stability Index 1
No Data
1.2
1
0.8
0.6
0.4
0.2
0
3/5/03 12:47:00 PM
5.00 Min(s)
3/5/03 12:52:00 PM
Stability Index 2
No Data
1.2
1
0.8
0.6
0.4
0.2
0
3/5/03 12:47:00 PM
5.00 Min(s)
3/5/03 12:52:00 PM
6FU 40
5FU 41
4FU 42
3FU 42
2FU 41
1FU 39
6FL 46
5FL 45
4FL 42
3FL 45
2FL 50
1FL 48
4FLL 47
EU 39
EL 41
-90
Mould Level -21
-100
Mould Width 1609.81
-110
3/5/03 12:47:00 PM
5.00 Min(s)
3/5/03 12:52:00 PM
WU 38
WL 47
1LU 39
2LU 41
3LU 41
4LU 43
5LU 42
6LU 39
1LL 43
2LL 45
3LL 49
4LL 45
5LL 46
6LL 45
4LLL 53
Legend
Selected
Active
123
123
Deselected
Narrowface
East Broadface
Center Broadface
West Broadface
Narrowface


Caster S.O.S.
State: PreStartup
Main Screen
Heat # 142269
Slab ID # No Data
DOFASCO
Audio Alarm
Feedback
Tag Selection
Tag Status
Quick View
Trend Menu
Grade No Data Cast Length 0.00 SEN Depth -0.17 Speed 0.07 Stopper RP 46.0 E Narrow Taper 8.07 W Narrow Taper 8.07
Stability Index 1
No Data
1.2
1
0.8
0.6
0.4
0.2
0
3/5/03 12:47:25 PM
5.00 Min(s)
3/5/03 12:52:25 PM
Stability Index 2
No Data
1.2
1
0.8
0.6
0.4
0.2
0
3/5/03 12:47:25 PM
5.00 Min(s)
3/5/03 12:52:25 PM
6FU 40
5FU 41
4FU 42
3FU 43
2FU 41
1FU 39
6FL 49
5FL 47
4FL 45
3FL 48
2FL 50
1FL 51
4FLL 51
EU 39
EL 40
-90
Mould Level -21
-100
Mould Width 1609.81
-110
3/5/03 12:47:25 PM
5.00 Min(s)
3/5/03 12:52:25 PM
WU 38
WL 45
1LU 39
2LU 42
3LU 42
4LU 42
5LU 42
6LU 39
1LL 44
2LL 47
3LL 52
4LL 51
5LL 48
6LL 45
4LLL 63
Legend
Selected
Active
123
123
Deselected
Narrowface
East Broadface
Center Broadface
West Broadface
Narrowface


Caster S.O.S.
State:
Startup
Main Screen
Heat # 142269
Slab ID # No Data
DOFASCO
Audio Alarm
Feedback
Tag Selection
Tag Status
Quick View
Trend Menu
Grade No Data Cast Length 2.87 SEN Depth -0.1710 Speed 0.85 Stopper RP 63.6 E Narrow Taper 8.07 W Narrow Taper 8.07
Stability Index 1
1.42
1.2
1
0.8
0.6
0.4
0.2
0
3/5/03 12:53:00 PM
5.00 Min(s)
3/5/03 12:58:00 PM
Stability Index 2
0.90
1.2
1
0.8
0.6
0.4
0.2
0
3/5/03 12:53:00 PM
5.00 Min(s)
3/5/03 12:58:00 PM
6FU 98
5FU 104
4FU 108
3FU 105
2FU 105
1FU 101
6FL 107
5FL 101
4FL 115
3FL 99
2FL 101
1FL 98
4FLL 107
EU 102
EL 97
-90
Mould Level -150
-100
Mould Width 1609.81
-110
3/5/03 12:53:00 PM
5.00 Min(s)
3/5/03 12:58:00 PM
WU 92
WL 90
1LU 99
2LU 100
3LU 107
4LU 110
5LU 98
6LU 94
1LL 106
2LL 105
3LL 107
4LL 99
5LL 98
6LL 93
4LLL 100
Legend
Selected
Active
123
123
Deselected
Narrowface
East Broadface
Center Broadface
West Broadface
Narrowface

Caster S.O.S.

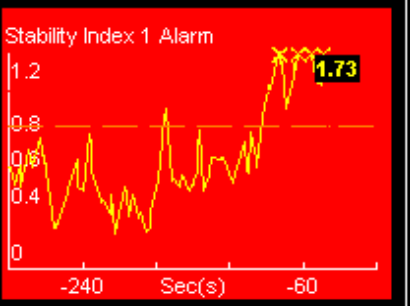
Stability Index 1 1.73

Stability Index 1

Stability Index 2 0.88

DOFASCO

Main Screen | Stability Index 1 | Stability Index 2 | Tag Selection | Tag Status | Quick View | Trend Menu



Top 5 Stability Index 1

(1) Fixed Face Temp Diff 6

(2) Mold Osci Stroke

(3) Loose Upper 4 TC

(4) Mould Delta Temp East

(5) Heat Flux for East Side

Heat Removal

Loose

Fixed

East

West

Miscellaneous

Cast Speed

SEN Depth

Stopper Rod Pos.

Negative Strip

Carbon Eqv.

Carbon %

Tundish

Net Weight

Arg Flow

Temperature

Superheat

6FU | 5FU | 4FU | 3FU | 2FU | 1FU

Dif. | Dif. | Dif. | Dif. | Dif. | Dif.

6FL | 5FL | 4FL | 3FL | 2FL | 1FL

EU

Dif.

EL

E Narrow Taper | Width | W Narrow Taper

Level

E Width Chg Spd | Osc Frequency | W Width Chg Spd

Osc Stroke

WU

Dif.

WL

1LU | 2LU | 3LU | 4LU | 5LU | 6LU

Dif. | Dif. | Dif. | Dif. | Dif. | Dif.

1LL | 2LL | 3LL | 4LL | 5LL | 6LL

Mold Water Delta Te

Fixed

Loose

East

West

Mold Water

Inlet Temp.

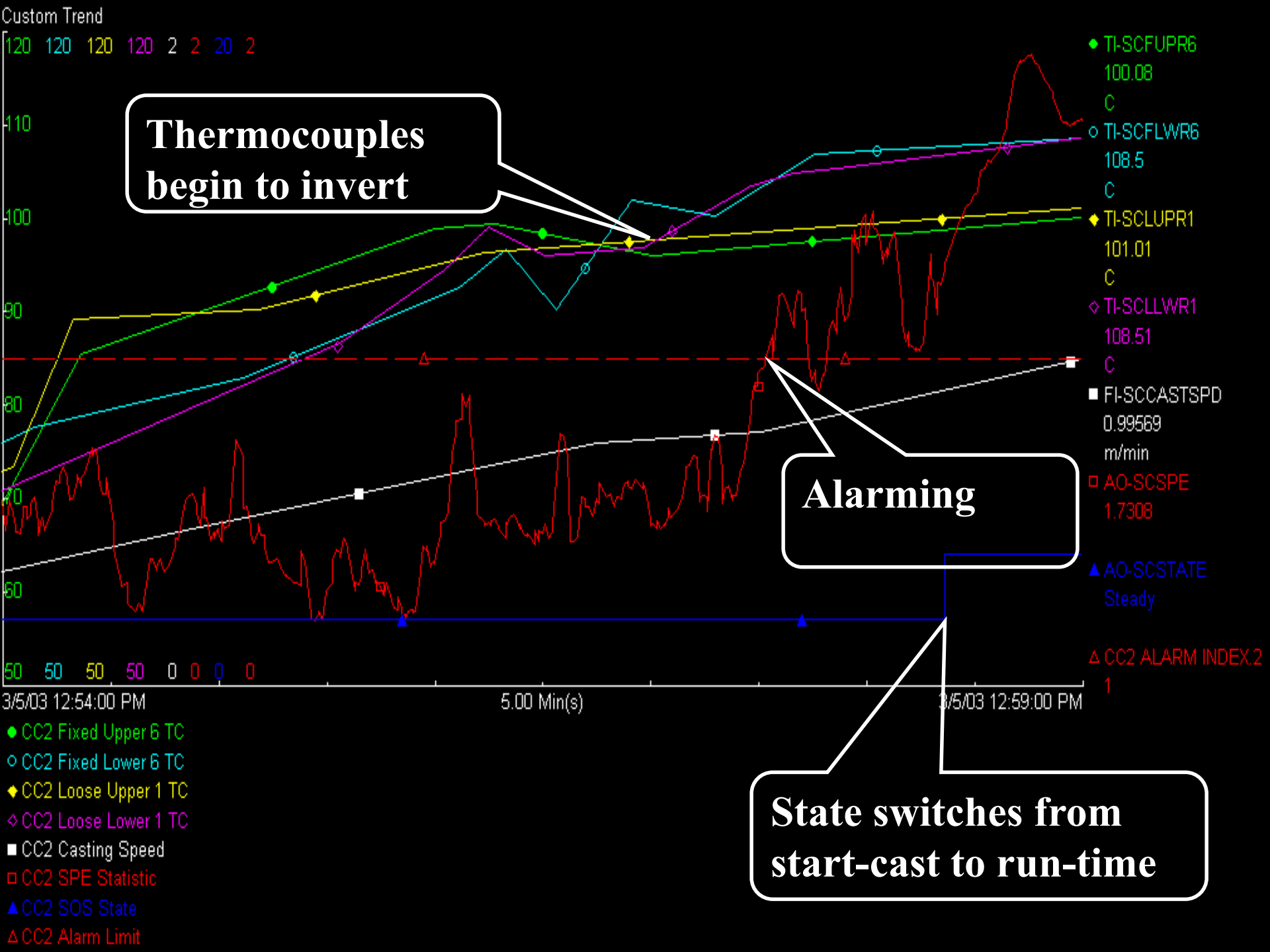
Mold Water Flow

Fixed

Loose

East

West


Custom Trend
120 120 120 120 2 2 20 2
110
100
90
80
70
60
50 50 50 50 0 0 0 0
Thermocouples begin to invert
Alarming
State switches from start-cast to run-time
TI-SCFUPR6
100.08
C
TI-SCFLWR6
108.5
C
TI-SCLUPR1
101.01
C
TI-SCLLWR1
108.51
C
FI-SCCASTSPD
0.99569
m/min
AO-SCSPE
1.7308
AO-SCSTATE
Steady
CC2 ALARM INDEX.2
1
3/5/03 12:54:00 PM
5.00 Min(s)
3/5/03 12:59:00 PM
CC2 Fixed Upper 6 TC
CC2 Fixed Lower 6 TC
CC2 Loose Upper 1 TC
CC2 Loose Lower 1 TC
CC2 Casting Speed
CC2 SPE Statistic
CC2 SOS State
CC2 Alarm Limit

Agenda

- Introduction
  - Caster SOS™ and New Requirements
- System Enhancements
  - Visualization
  - Expanded Monitoring
  - Historical Support Utilities
- Summary

Performance Monitor of Process Alarms

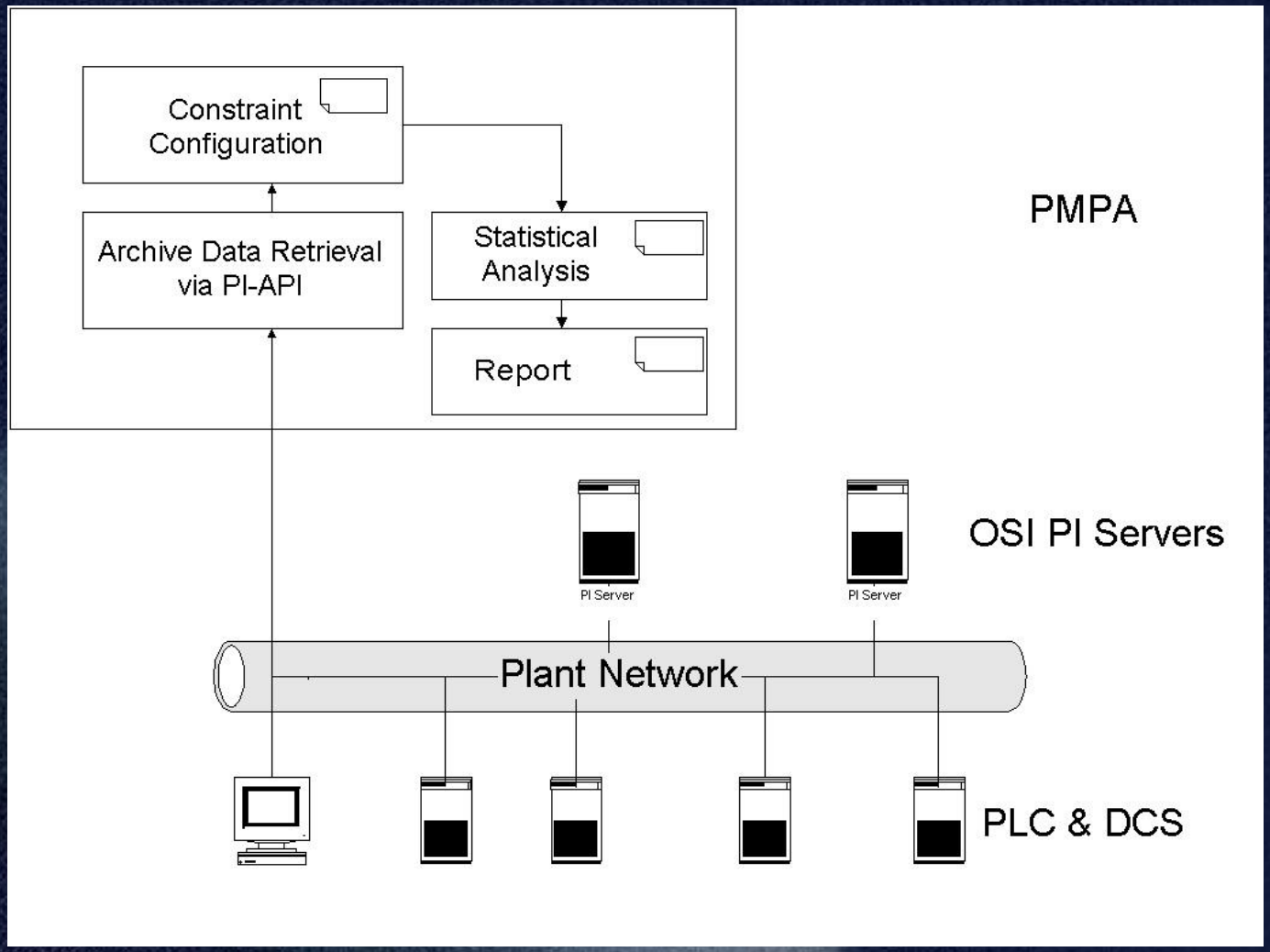
- Purpose: Analysis tool that can be used to statistically analyze PI data

Performance Monitor of Process Alarms

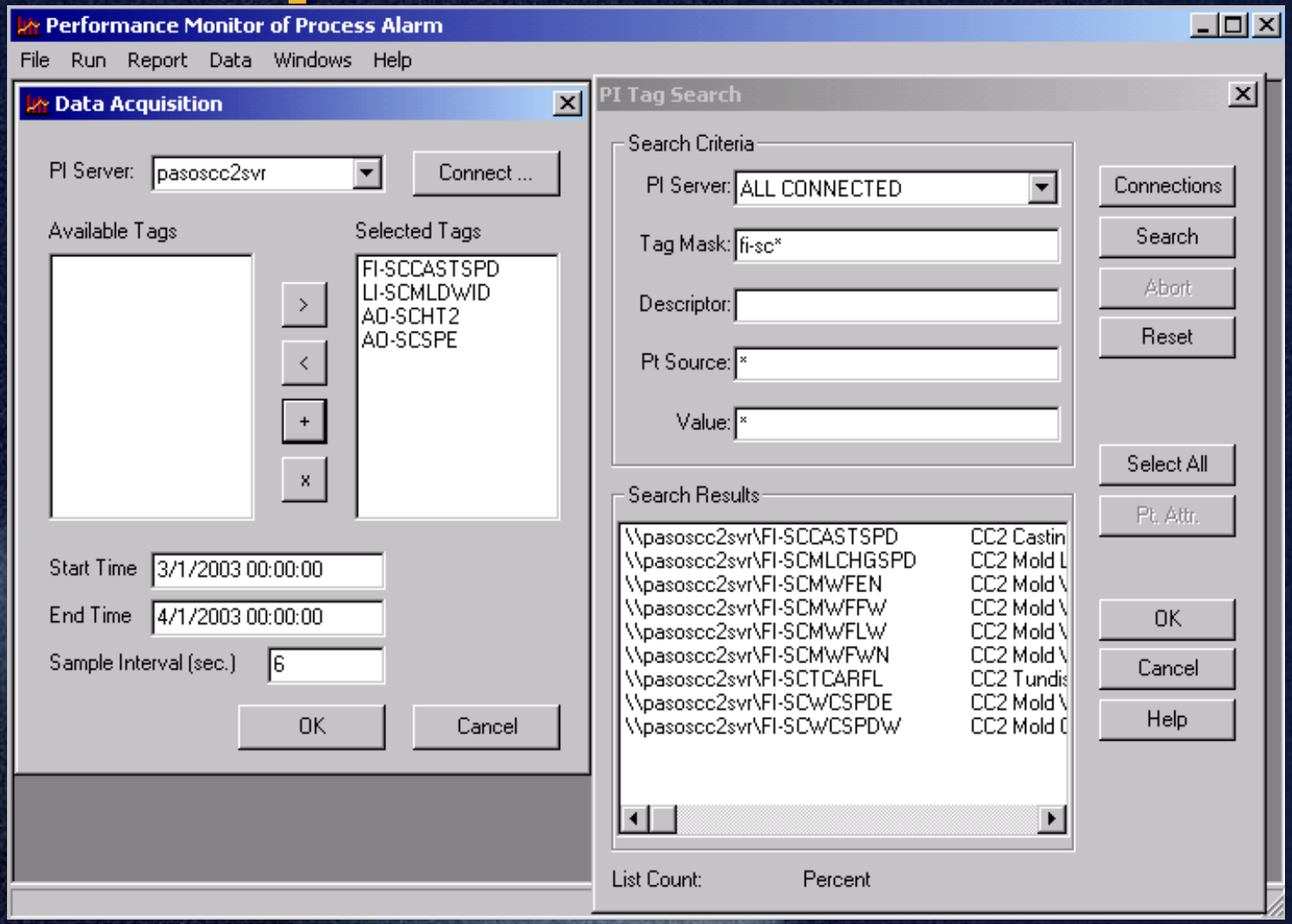
Features

- User selects PI tags, start/end time/interval for the investigation
- Advanced condition based data retrieving and analysis (complex queries can be setup with and/or logic operators)
- Develops generic report
- Analysis can be scheduled to run periodically

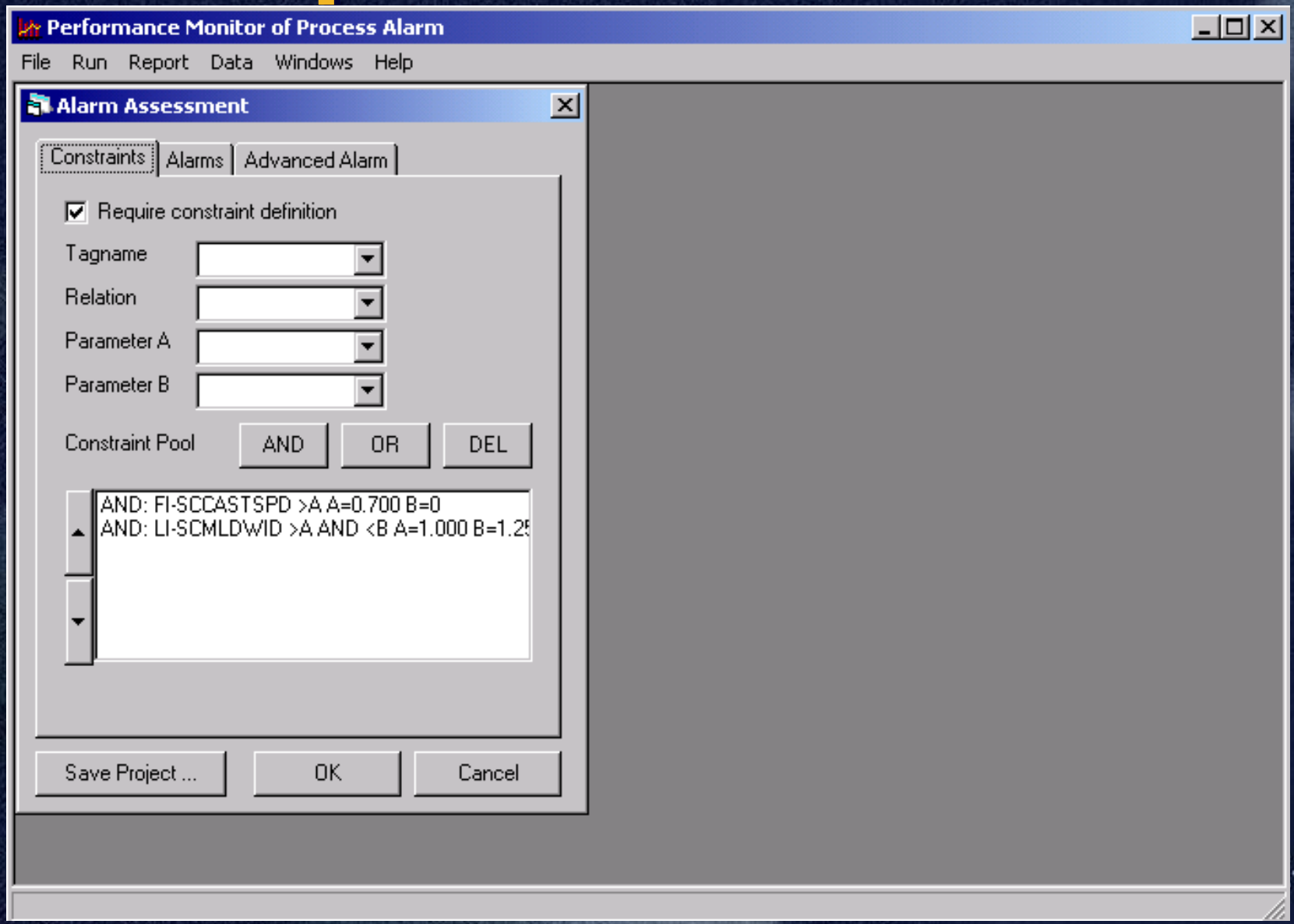
Performance Monitor of Process Alarms



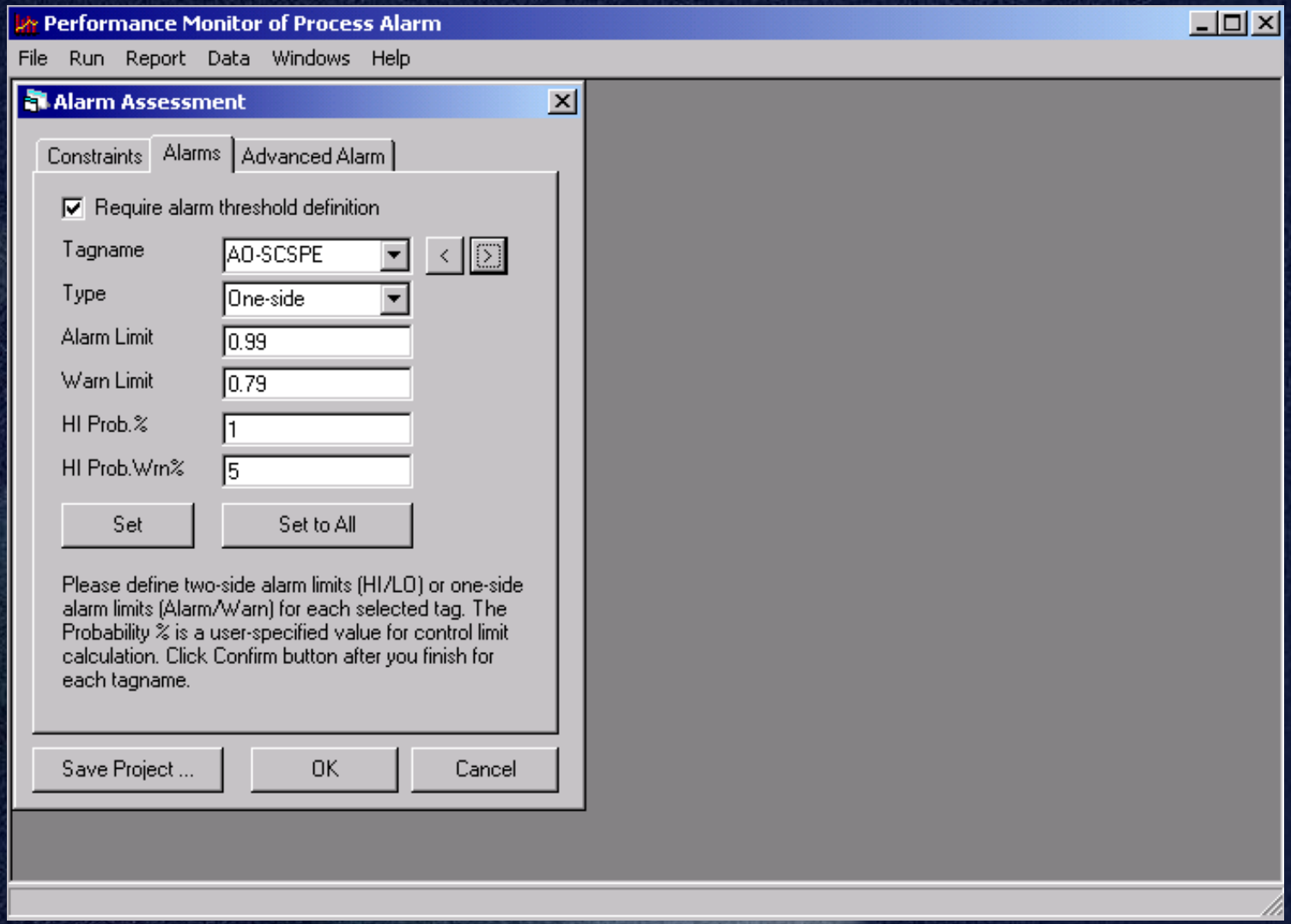
Example 3


Performance Monitor of Process Alarm
File Run Report Data Windows Help
Data Acquisition
PI Server: pasoscc2svr
Connect ...
Available Tags
Selected Tags
FI-SCCASTSPD
LI-SCMLDWID
AO-SCHT2
AO-SCSPE
>
<
+
x
Start Time 3/1/2003 00:00:00
End Time 4/1/2003 00:00:00
Sample Interval (sec.) 6
OK
Cancel
PI Tag Search
Search Criteria
PI Server: ALL CONNECTED
Tag Mask: fi-sc*
Descriptor:
Pt Source: *
Value: *
Connections
Search
Abort
Reset
Select All
Pt. Attr.
OK
Cancel
Help
Search Results
\\pasoscc2svr\FI-SCCASTSPD CC2 Castin
\\pasoscc2svr\FI-SCMLCHGSPD CC2 Mold L
\\pasoscc2svr\FI-SCMWFEN CC2 Mold \
\\pasoscc2svr\FI-SCMWFFW CC2 Mold \
\\pasoscc2svr\FI-SCMWFLW CC2 Mold \
\\pasoscc2svr\FI-SCMWFWN CC2 Mold \
\\pasoscc2svr\FI-SCTCARFL CC2 Tundis
\\pasoscc2svr\FI-SCWCSPDE CC2 Mold \
\\pasoscc2svr\FI-SCWCSPDW CC2 Mold
List Count:
Percent

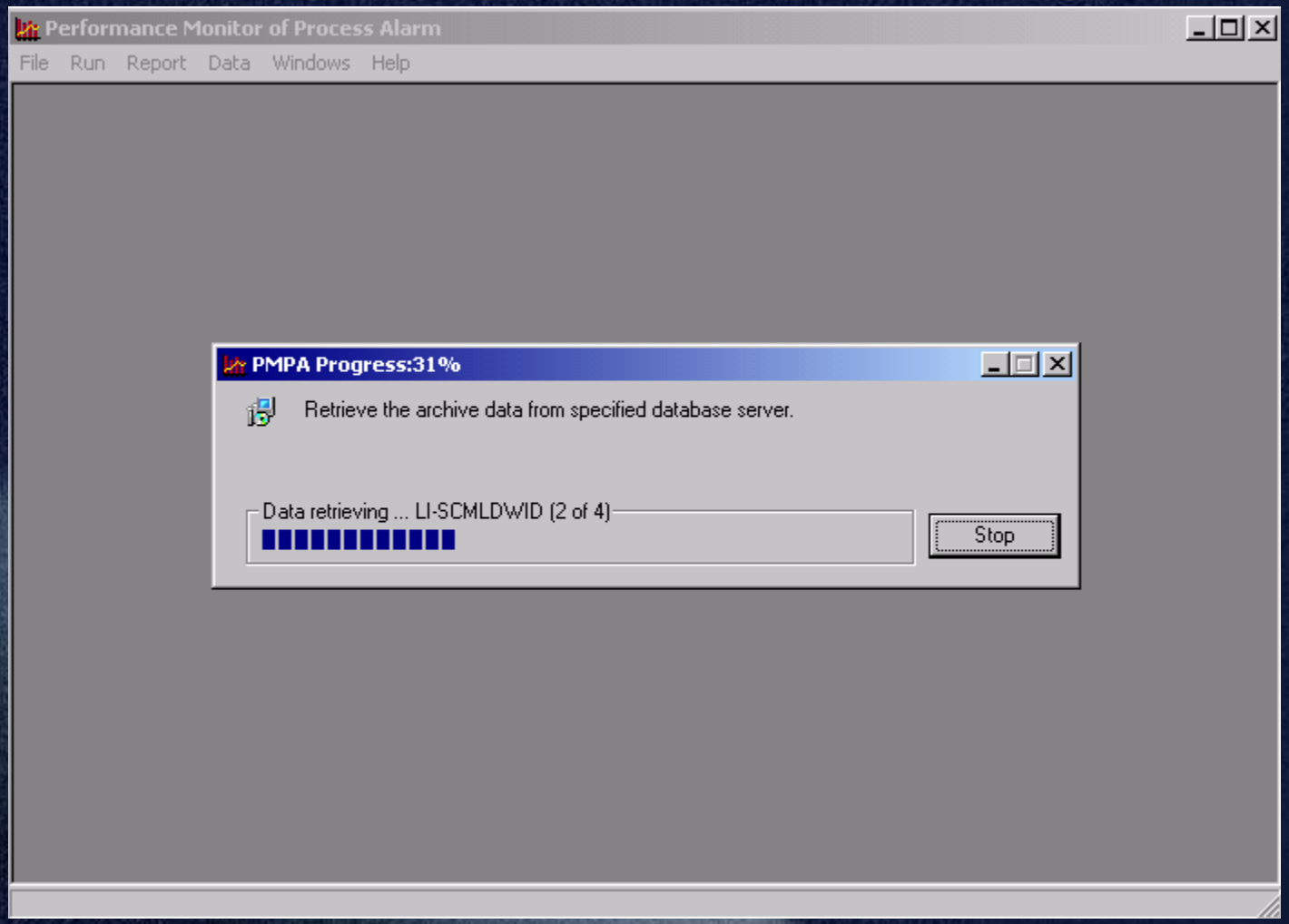
Example 3


Performance Monitor of Process Alarm
File Run Report Data Windows Help
Alarm Assessment
Constraints Alarms Advanced Alarm
Require constraint definition
Tagname
Relation
Parameter A
Parameter B
Constraint Pool
AND
OR
DEL
AND: FI-SCCASTSPD >A A=0.700 B=0
AND: LI-SCMLDWID >A AND <B A=1.000 B=1.25
Save Project ...
OK
Cancel

Performance Monitor of Process Alarms



Performance Monitor of Process Alarms



Tag name: AO-SCHT2 CC2 HT2 Statistic
Time period: 3/1/2003 00:00:00 to 4/1/2003 00:00:00
Sample interval: 6 second(s)
Number of samples: 446401
Constraint:
AND: FI-SCCASTSPD >A A=0.700 B=0
AND: LI-SCMLDWID >A AND <B A=1.000 B=1.250
Number of valid samples: 102869
Percentage of valid samples: 23.04%
Data statistics:

mean	std	min	max	unit:
0.20	0.13	0.00	3.68	
0~20%	20~40%	40~60%	60~80%	80~100%
102507	341	15	4	2

Thresholds:
TYPE = One-side HI = 0.99 LO = 0.79
Critical Limits:
HI Prob.wrn% = 5 HI Prob.% = 1
UCLWarn = 0.4373037 UCL = 0.4373037

For Alarm Limit ...

Number of alarms: 17
Percentage of alarming time: 0.02%
Alarm duration statistics:

mean	std	min	max	unit: Sec.
25.76	40.01	6.00	144.00	
0~20%	20~40%	40~60%	60~80%	80~100%
14	1	0	1	1

Alarm interval statistics:

mean	std	min	max	unit: Sec.
142627.90	181681.30	6.00	543660.00	
0~20%	20~40%	40~60%	60~80%	80~100%
10	1	1	3	1

Alarm list:

Alarm	Start time	End Time	Duration	Interval
1	03/01/2003 15:17:42	03/01/2003 15:18:00	18	0
2	03/01/2003 21:57:18	03/01/2003 21:57:24	6	23958
3	03/02/2003 14:28:00	03/02/2003 14:28:24	24	59436
4	03/03/2003 18:53:42	03/03/2003 18:53:54	12	102318
5	03/08/2003 18:48:30	03/08/2003 18:49:06	36	431676
6	03/12/2003 14:46:00	03/12/2003 14:46:06	6	331014
7	03/16/2003 09:27:42	03/16/2003 09:27:54	12	326496
8	03/22/2003 16:28:54	03/22/2003 16:29:06	12	543660
9	03/25/2003 18:04:48	03/25/2003 18:07:12	144	264942
10	03/25/2003 19:16:12	03/25/2003 19:16:18	6	4140
11	03/25/2003 19:16:54	03/25/2003 19:17:00	6	36
12	03/25/2003 19:17:24	03/25/2003 19:17:30	6	24
13	03/25/2003 19:17:36	03/25/2003 19:17:42	6	6
14	03/25/2003 19:17:48	03/25/2003 19:18:00	12	6
15	03/25/2003 19:18:24	03/25/2003 19:18:36	12	24
16	03/25/2003 19:19:24	03/25/2003 19:21:18	114	48
17	03/28/2003 01:19:00	03/28/2003 01:19:06	6	194262

Performance Monitor of Process Alarms

Benefits

- Other tools (E.g. Data link for Excel) limited by the amount of data that can be analyzed at once
- Enables what/if scenarios to be performed in seconds
- Support the monitoring system
  - determine alarming thresholds

Agenda

- Introduction
  - Caster SOS and New Requirements
- System Enhancements
  - Visualization
  - Expanded Monitoring
  - Historical Support Utilities
- Summary

Enhancing the SOS system with PI

- Improved data visualization in real time
- HMI for transient monitoring
- Supporting tools for historical data analysis

Caster SOS™

Opportunities

Caster Stability/Quality Prediction/Breakout Avoidance

Process

Data

Temperatures

Cooling Water Data

Stopper Rod Position

Heat Transfer

Negative Strip Time

Etc.

DAT Solution

Caster SOS

Action

Automatically Slow Cast Speed

Automatically Disposition Product

Strand Operator Slows Down Cast Speed

Operator Deselects Faulty Signal from the Model

Information

Alarms and Warnings through 2 Stability Indices

Top 5 Influences to the Problem

Trending of Data

Thermal Contour Map

Process Monitoring Framework

- Not just limited to caster monitoring
- Applicable in most industries

Batch Anneal

Opportunities

Consistent Heating

Process

Data

DAT Solution

Temperatures

Fuel Rates

Coil Size

Recipe

Etc.

Action

Information

Paper Machine

Opportunities

Sheetbreak Prevention

Process

Data

DAT Solution

Speeds

Drive Currents

Material Properties

Tensions

Etc.

Action

Information

Summary

- Comprehensive Monitoring Solution
- Utilizes OSIsoft technology
- Internal Development
- Solid Results
- Growth Potential

AUTOMATION + TECHNOLOGY

DOFASCO

AUTOMATION TECHNOLOGY

Real Solutions in Real-Time

Questions?

Vit Vaculik
vit_vaculik@dofasco.ca
905-548-7200 ext. 2992

Adam Smyth
adam_smyth@dofasco.ca
905-548-7200 ext. 3317

Web Site
http://dat.dofasco.ca