

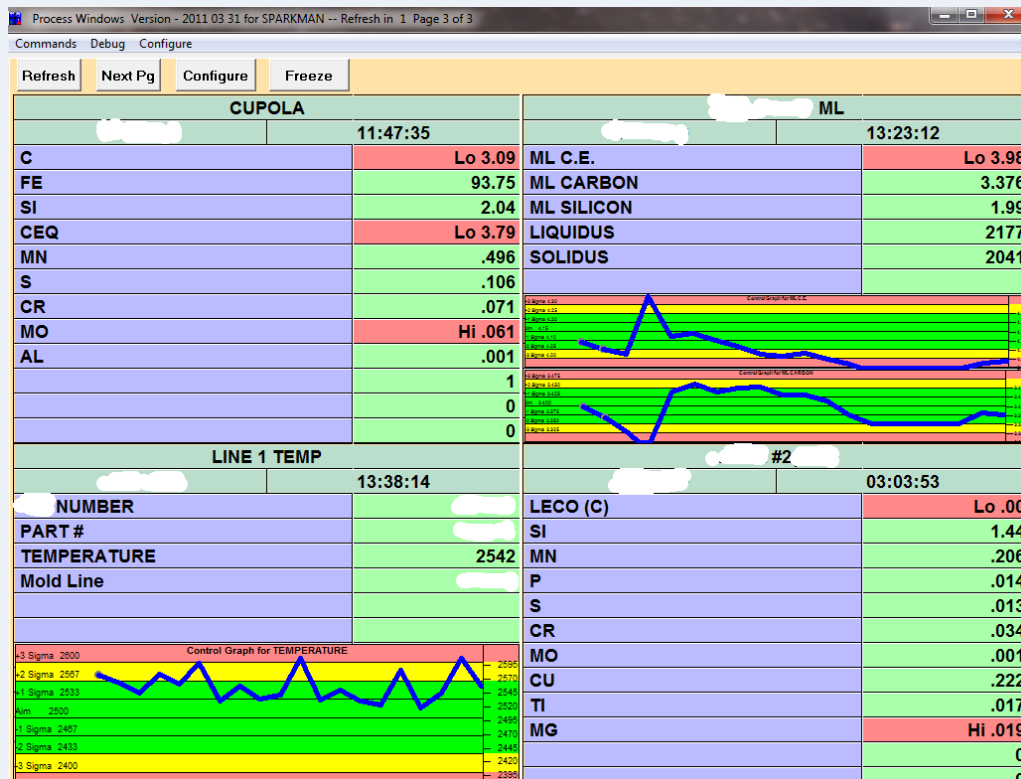


Graphic SPC - LIMS Laboratory Information System

LIMS systems are becoming a necessary tool to help foundries keep track of their processes and all the information associated with the making of castings. A returned casting, an inquiry from a potential customer, or just the boss asking how we are doing with that new sand muller can ruin your day if you just have a paper system. But with a good LIMS system, you can tell your boss, just a second, and in moments have pertinent graphics up on the screen.

We originally developed Graphic SPC to provide 3 different views of the data: a shop floor view for the production worker, a short term view for the foreman, and a data mining tool for the superintendent/manager.

The shop floor view developed into a rule-based warning device to let the operators know if they were out of range or trending out of range. Foundry specifications, being very complex, had to be taken into account. So the specifications were refined to allow not only for each process to have its ranges and rules, but to allow part number exceptions to tighten or loosen those ranges.



Dates, process names and part numbers have been erased in the above example to preserve the identity of the foundry. But here you can see spectrometer, LECO® and MeltLab® data combined, flagged if high



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or low, and recent history of individual tests graphed. This data is updated through a LAN (local area network) every 15, 30, 45 or 60 seconds per user choice. The user also configures which processes and which tests are to be displayed on the user's computer, and up to 16 processes of 12 tests each can be monitored in real time. Clicking on any process quickly brings up the recent history of that process with up to 60/120 different variables.

In addition to capturing data from Spectrometers (Baird®, ARL®, Spectro®, OBLF®, and others), GSPC has modules for Carbon/Sulfur and Oxygen/Nitrogen combustion instruments such as LECO when they have a serial interface. Some brinell machines likewise have direct readouts through a serial port, and of course, the modern sand controllers such as Hartley® have computer interfaces through serial ports so that data is readily captured. We have even gone so far as to be able to capture data from our competitor ElectroNite® with modules for their newer temperature and their thermal analysis instruments. It was hard seeing ElectroNite's instrument confuse TLU (temperature of liquidus undercooling) with TL (temperature of Liquidus), and calling the Eutectic arrest the Solidus arrest, but we captured their data anyway.

An additional important part of any foundry process control system is the sand lab. Here we have combined our knowledge of foundry sand properties with the Professor Heine/Richard Green research to give access to all the different process parameters of foundry green sand. Include the Moisture, Green Strength, Compactability and MB Clay tests and you have access to the following:

Sand Variable is		
<input type="radio"/> None	<input type="radio"/> Eq Green Str	<input type="radio"/> Test Clay Parm
<input type="radio"/> Moisture *	<input type="radio"/> Moist/GS/Clay	<input type="radio"/> Avail MBlue
<input type="radio"/> Compactability *	<input type="radio"/> Eff Clay	<input type="radio"/> Clay Eff
<input type="radio"/> Green Strength *	<input type="radio"/> Moist Index	<input type="radio"/> Working Bond
<input checked="" type="radio"/> Methylene Blue Clay *	<input type="radio"/> Compact Index	<input type="radio"/> Avail Bond
<input type="radio"/> Sand Temp	<input type="radio"/> Sys Eff	<input type="radio"/> Bond Eff
<input type="radio"/> Eq Moister	<input type="radio"/> GS Eff	<input type="radio"/> Water Balance
<input type="radio"/> Eq Clay-Water	<input type="radio"/> Mulling Eff	<input type="radio"/> Free Clay
<input type="radio"/> Eq Compact	<input type="radio"/> Eff MB Clay	<input type="radio"/> Moist/Compact
<input type="radio"/> Clay Water	<input type="radio"/> Eq Clay Parm	<input type="radio"/> MB Clay/Water

All the other tests (except sand temperature) are equations and ratios developed by the team of Heine/Green in the 70's and 80's. I personally checked all the equations with Professor Heine myself in person because some were improperly printed when published (unbalanced parenthesis).

The last form of data viewing is the now famous "data mining" ability – the ability to find relationships and hidden facts in the historical data. The MeltLab system comes in a small and a large version. The first can track the last 65,000 samples per process data base, and the large one can track 200,000



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samples per process expandable to 1,000,000 with enough computer memory. Data can be searched by process, by date, time/shift, and search conditions can be set. The results include standard statistics for each variable, ability to cut and paste data from GSPC to Microsoft Excel and Word and the ability to compare “before and after” to see if process changes are effective, and if so, how effective. Consider how much better your foundry can operate with better more timely process information.

Search | Dates | Statistics | Data | X-Bar | Certification | Histogram | MultiGraph | Reports

Search Information

Search: 10. HARTLEY

Time of Day

Starting: 3/ 2/2010

Ending: 3/ 2/2010

Time Periods

All Shifts

First Shift

Second Shift

Third Shift

First and Second

Second and Third

Third and first

Starting at / ending at

Between the hours of

00:00 | 23:59

Speed Setup

Speed Dates

Today

Yesterday

This Week

One Week

This Month

One Month

This Year

One Year

Two Years

Entire Data Base

Special

Data Base Information

C:\G9000\DATA\HART2002.PT

Oldest Date Available: 6/20/2008

Latest Date Available: 3/ 2/2010

File Status: Open

Records Available: 65002

Current Date: Date

Records Found: Records

Searching Record: No Search

Previous Searches and Data Base Files

Archive G9000

Search | Dates | Statistics | Data | X-Bar | Certification | Histogram | MultiGraphs | Reports

Control Graph for Ti

Capability

CpK	2.02
CpKU	2.04
CpKL	2.02
Cpi	2.03
Avg	.010
Aim	.010
Mode	.010
Std	.0012
Sig	.0016
DSig	.0033
LCL	-.0000
UCL	.0200
LPL	.0050
UPL	.0149
Low	.006
High	.016
Count	1043
Sum	10
From	8/2/10
To	10/6/10

Variable Graphed

33 Ti

Graphic Options

Trend Graphic

Capability Graphic

Control Graphic

Color

Full Stats

Capabilt

Statistics

Statistics Ti	Values
Maximum Value	0.016
Mean Value	0.011
Minimum Value	0.006
Calc Sigma	0.0016
Calc RBar	
Calc Average	0.00996
Est. Sigma	0.0012
Calc CpK	2.02
Calc CpK upper	2.04
Calc CpK lower	2.02
Calc Cpi	2.03
Calc Lower Ctl Lim	0.009
Calc Upper Ctl Lim	0.011
Calc RBar	0.000
Calc Lower Ctl Ring	
Calc Upper Ctl Ring	
Calc Lower 3 Sigma	0.005
Calc Upper 3 Sigma	0.015
Spec Sig	0.003
Spec Aim	0.01000
Spec Min	
Spec Max	0.020
Spec RBar	
Spec Sigma	
Spec LCx	0.010
Spec UCx	0.010
Spec LCr	
Spec UCr	
Spec LSx	-0.000
Spec USx	0.020

