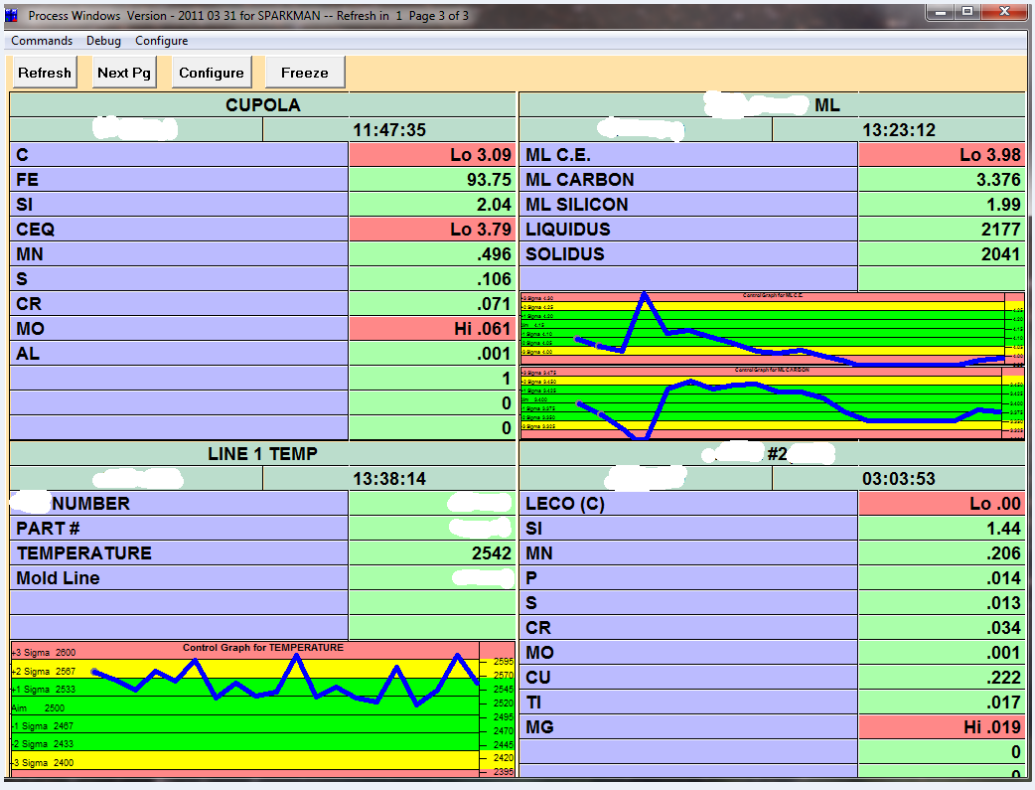
Graphic SPC - LIMS
Laboratory Information System

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.

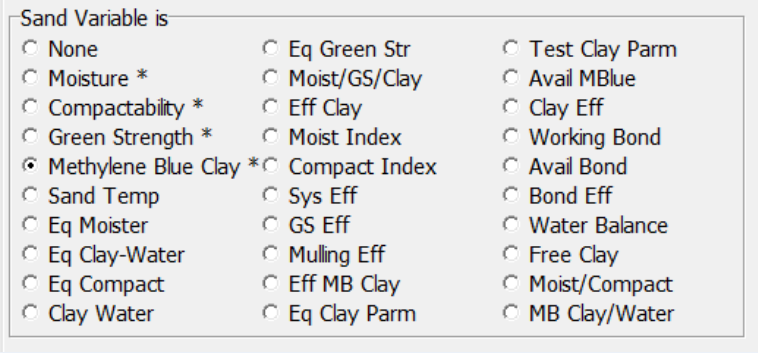


Dates, process names and part numbers have been erased in the above example to preserve the identity of the foundry. But here you can see spectrometer, LECO® and MeltLab® data combined, flagged if high

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:



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.