



QUARRY ACADEMY

Improving Processes. Instilling Expertise.



Plant / Crushing Automation 106

Bill Malone



Improving Processes. Instilling Expertise.

DYNO
Dyno Nobel



Agenda

- **Program Overview / Agenda**
- **Discuss crushing station automation**
 - ✓ Automation needs
 - ✓ Automation benefits
- **Show some examples & results**
 - ✓ Pay backs
 - ✓ Data evaluation

Automation

Audience Survey

- How many of you have some form of automation in your plants today?
- How many of you have some form of automation on your cone crushers today?
- How many of you really understand how the automation works and the importance of it in your plants today?



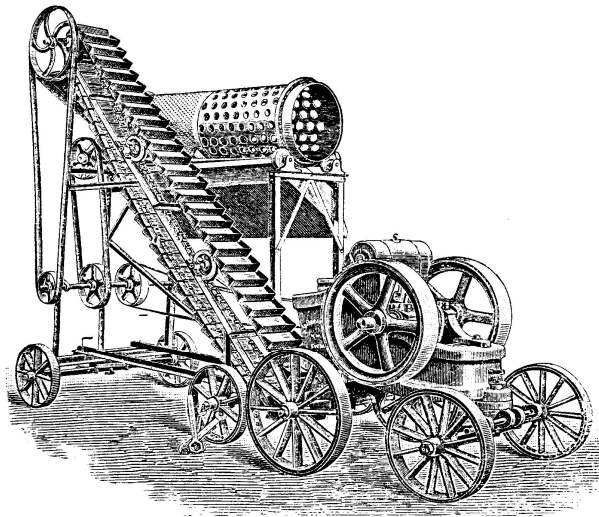
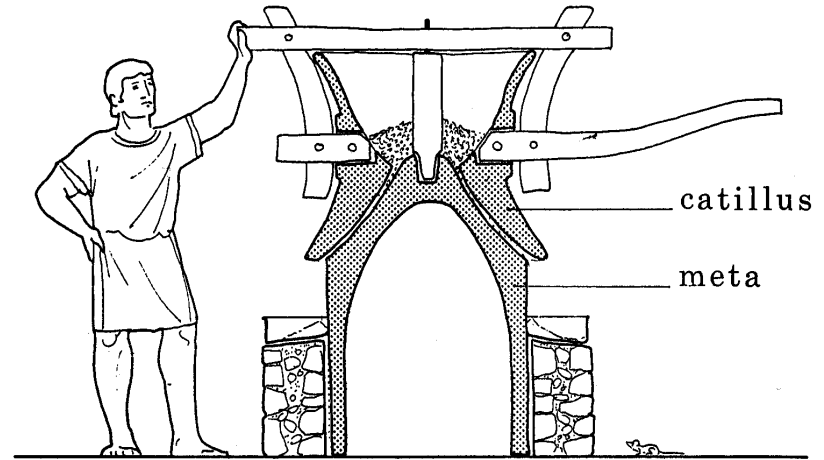
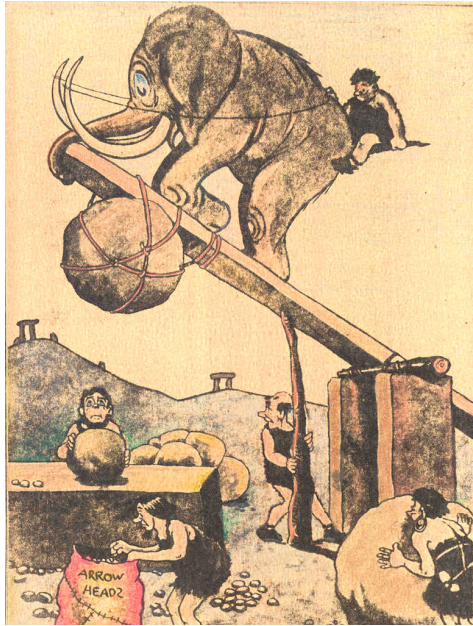


Why Automation

- Repetitive conditions
- Free up man power
- Increase reaction time
- Control a system remotely
- Increase efficiency of a system
- Maximize efficiency of a piece of equipment
- Increase product quality
- Protect capital investment
- Optimize a particular product
- Monitoring operation
- Data gathering



From early dawn



Help.....!



WHY AUTOMATE YOUR CONE CRUSHER ?

- **Realize a higher return on your investment.**
 - ✓ Higher net production of desired products
 - ✓ Optimum power utilization
 - ✓ Continuous generation of quality products
- **Protection of your investment**
 - ✓ Constant overload protection
 - ✓ Continuous adjustment compensating for changes in material characteristics
 - ✓ Ability to analyze operational data

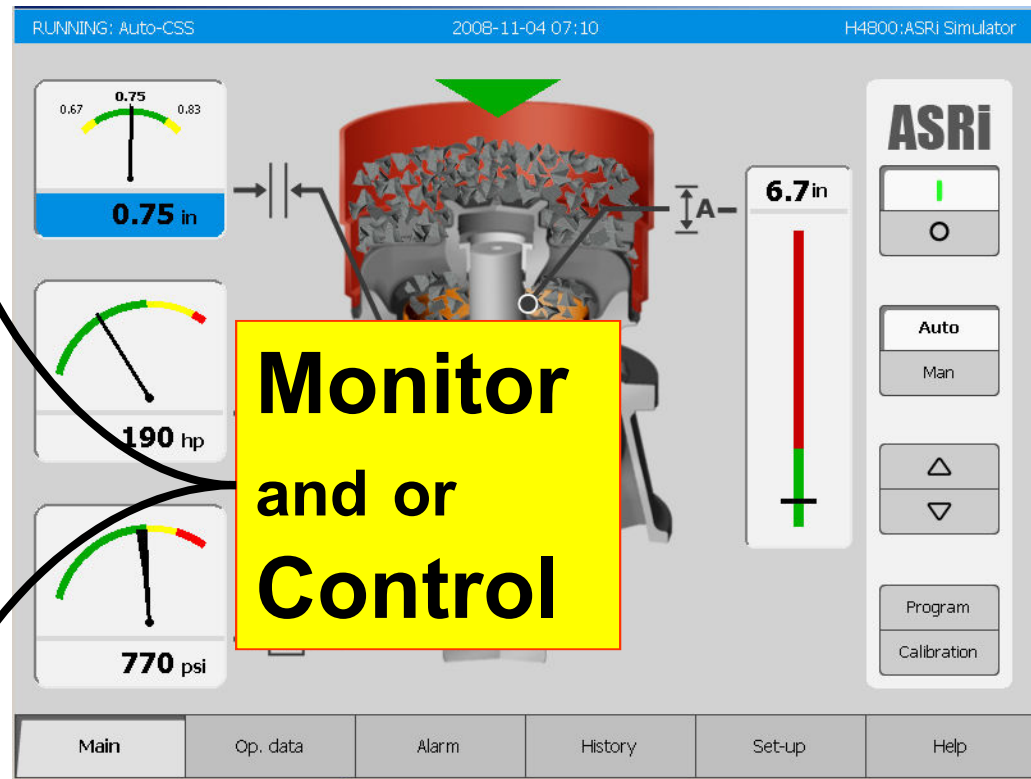


Monitor and Control
Available at the push of a button



Monitor and Control Available at the push of a button

- Closed Side Setting
- Horsepower in use
- Power consumption
- Load Time
- Operating time
- Hydraulic Pressure
- Lubrication Oil temperature
- Liner Wear
- Recorded data
- Graphing data



Automation

- **Other things to consider**
 - ✓ **Automation mode vs Manual mode**
 - ✓ **Durability of use**
 - ✓ **Is the tool easily used**

ASRI

Select program Edit program Calibration

11.9 mm

121 kW

4.6 MPa

Mantle Position Calibration & Liner Wear

Description

A-Min 15.0 mm
 A-Cal-Calculated 41.3 mm
 A-Cal-Latest 41.3 mm
 A-Bottom 100.5 mm
 Current 65.2 mm

Auto P1, Auto-CSS

Normal Set-up Op. data Alarm History Help

Op. data

Combination

Power 98 kW
 Pressure 3.4 MPa
 Lub. oil temp. 0.0 C
 A-dimension 69.7 mm
 CSS 14.9 mm

Operating time (h)

	Total	Loaded
Since original start-up	15	5
Since latest liner change	8	2
Since latest calibration	8	2
Since resetting		

Energy consumption (MWh)

	Total
Since original start-up	0.4
Since resetting	

Combined Status Listing

Normal Set-up Op. data Alarm History Help

ASRI Reporter

History

Power

12 seconds 10 minutes 1 hour 12 hours

2007-09-07 08:30:15.291

Historical Activity Log

Analog	Value	Unit	Status
A1 Average power - setpoint	294.8	h	Off
A2 Average power	190.3	h	Off
D1 Pump up			Off
D2			Off
D3			On

Normal Set-up Op. data Alarm History Help

Op. data

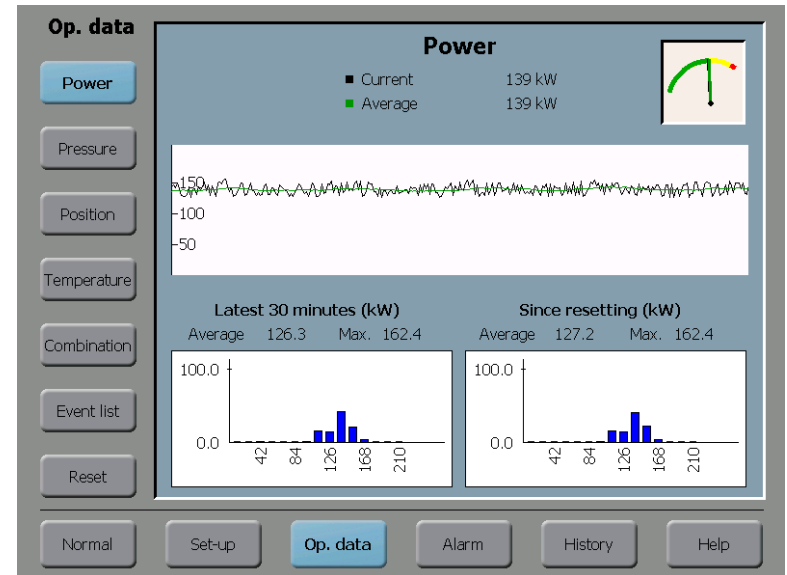
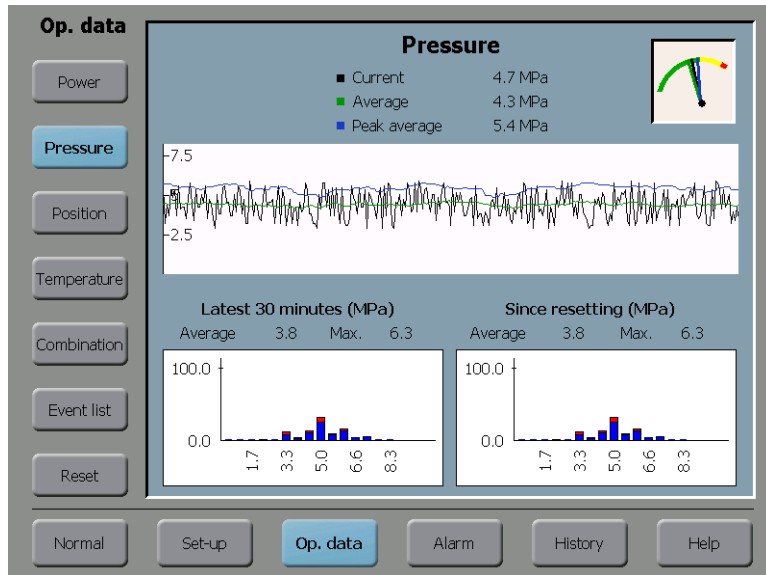
Temperature Return oil (C)

Current 0.0 C

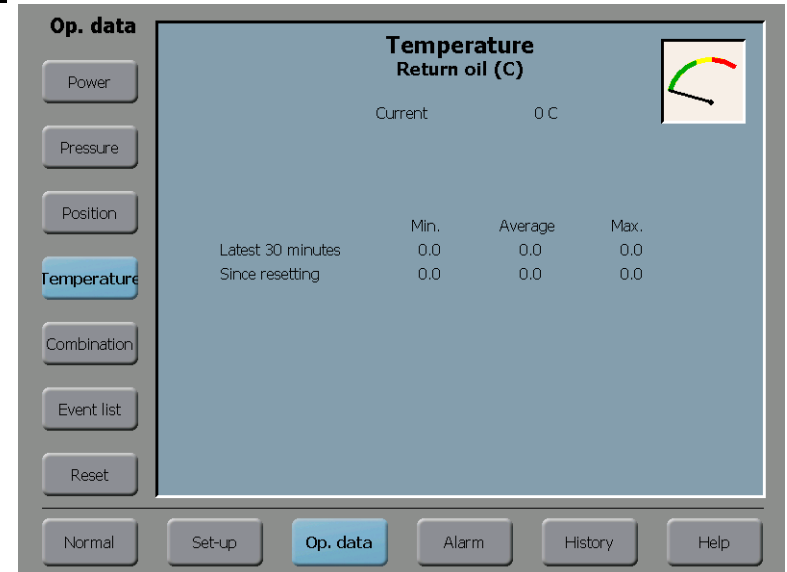
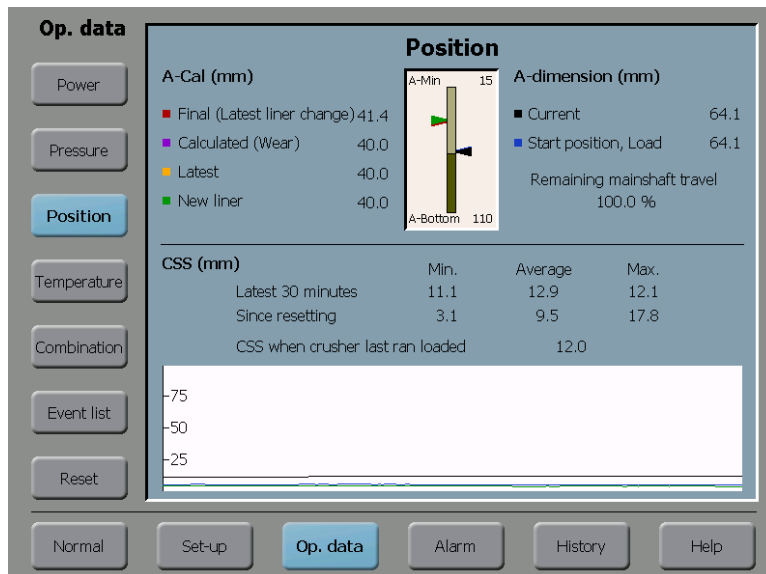
	Min.	Average	Max.
Latest 30 minutes	0.0	0.0	0.0
Since resetting	0.0	0.0	0.0

Lubrication Oil Temperature

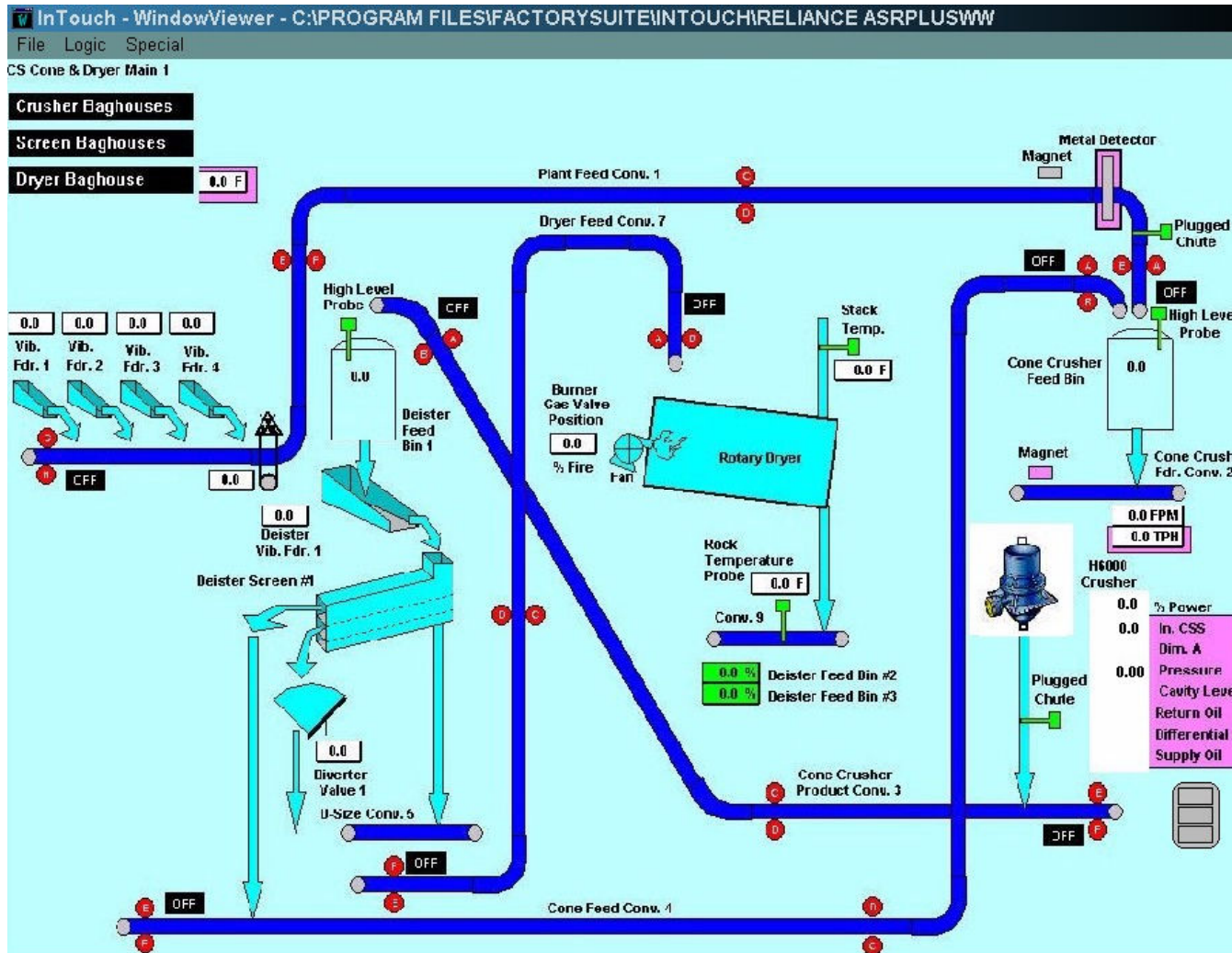
Normal Set-up Op. data Alarm History Help

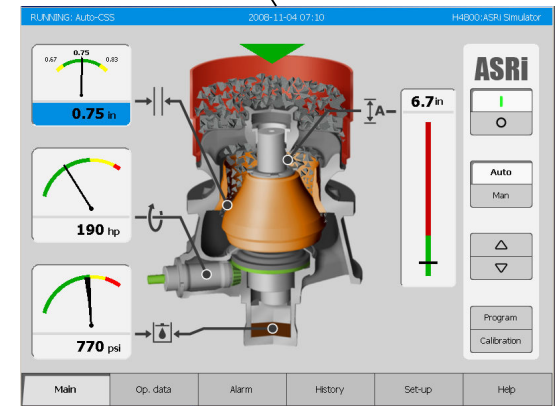
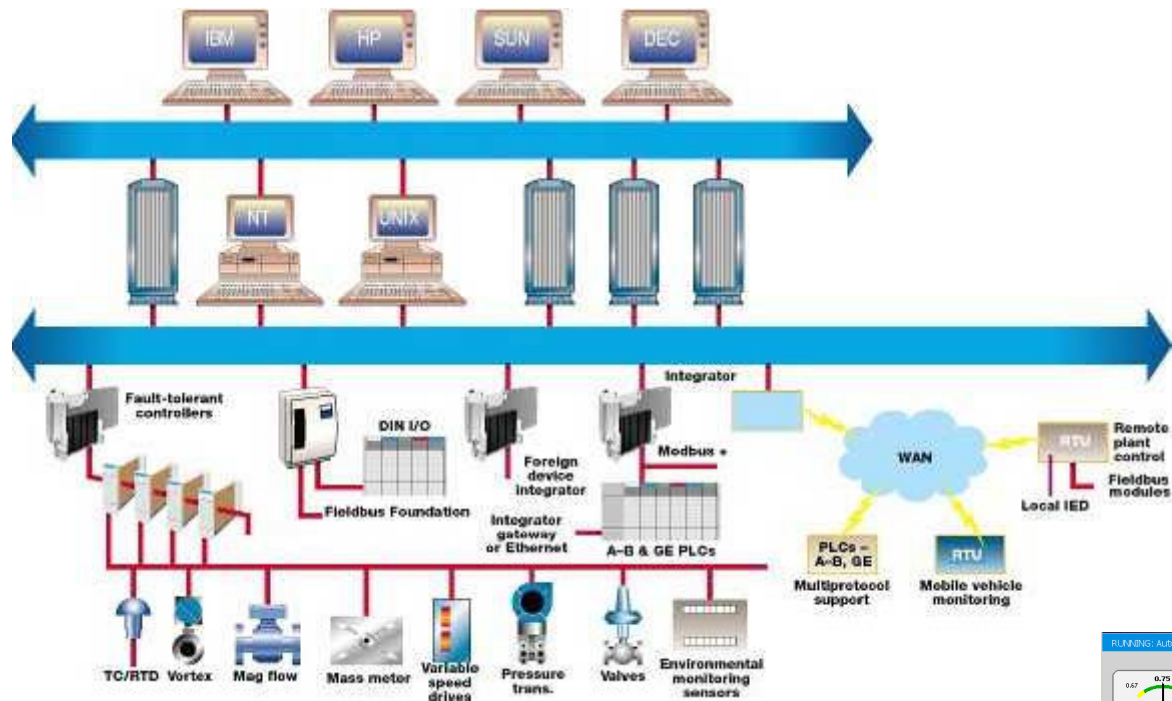


Historical Activity Logs



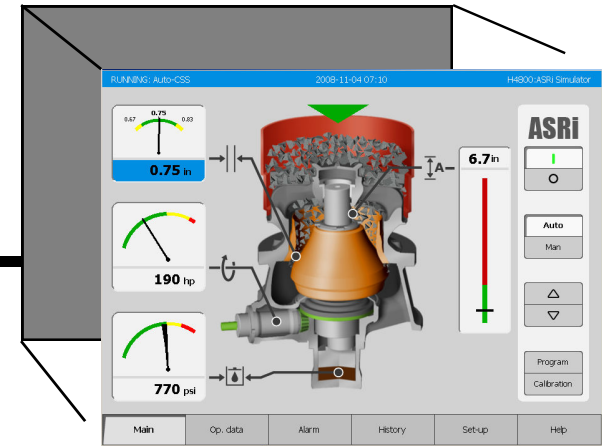
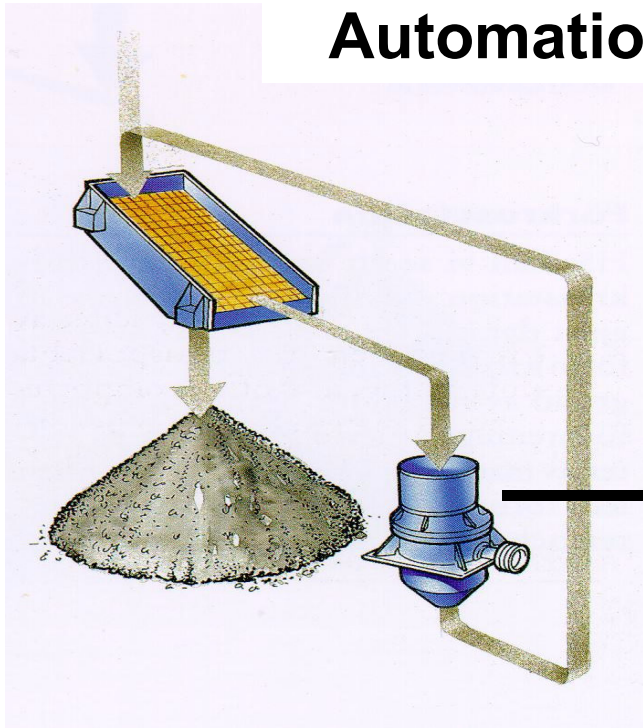
Detailed and comprehensive crusher data is easily available with a click of the mouse.



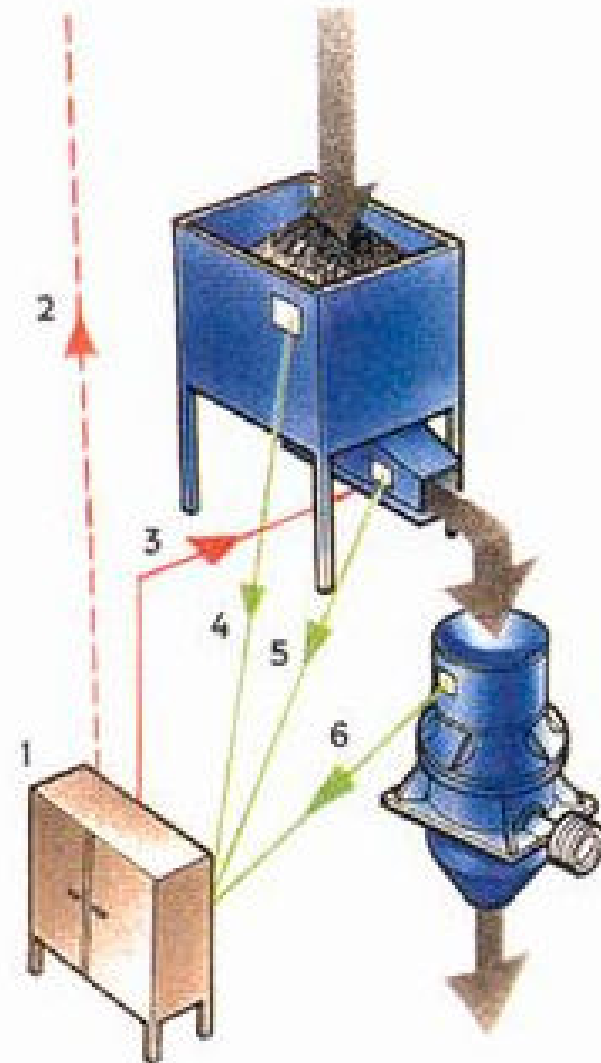


Crusher Automation and PLC System

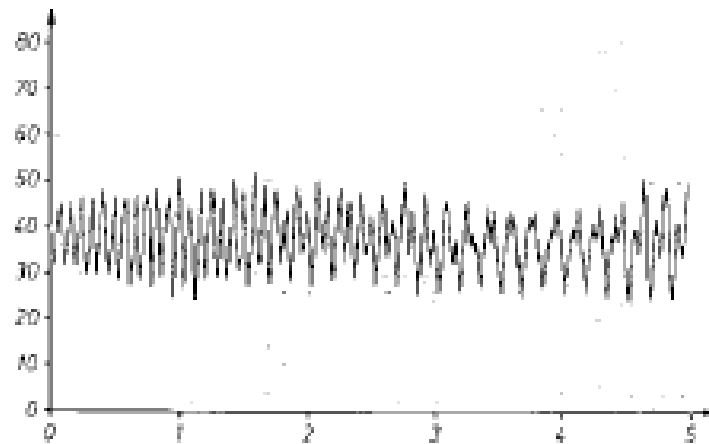
Continuous Control with Automation



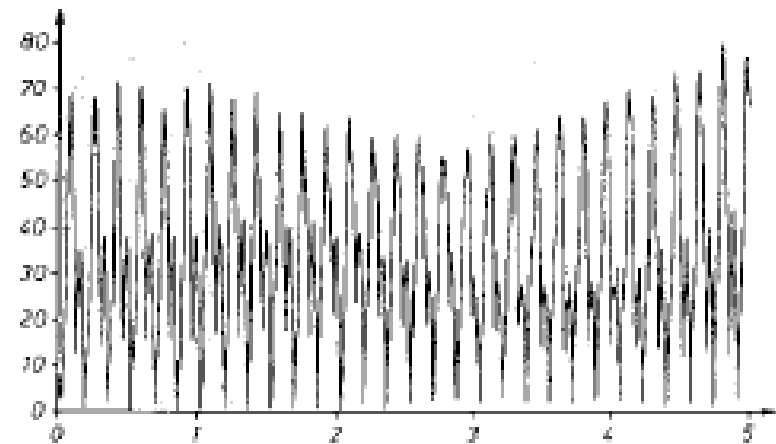
1. Switch gear unit
2. Stop signal to feeder
3. Control signal to feeder
4. Max. level in surge bin
5. Min. level in surge bin
6. Max. level in crusher feed hopper







Crushing force –
Choke-fed chamber



Crushing force-
Starve-fed chamber

Poor Feed



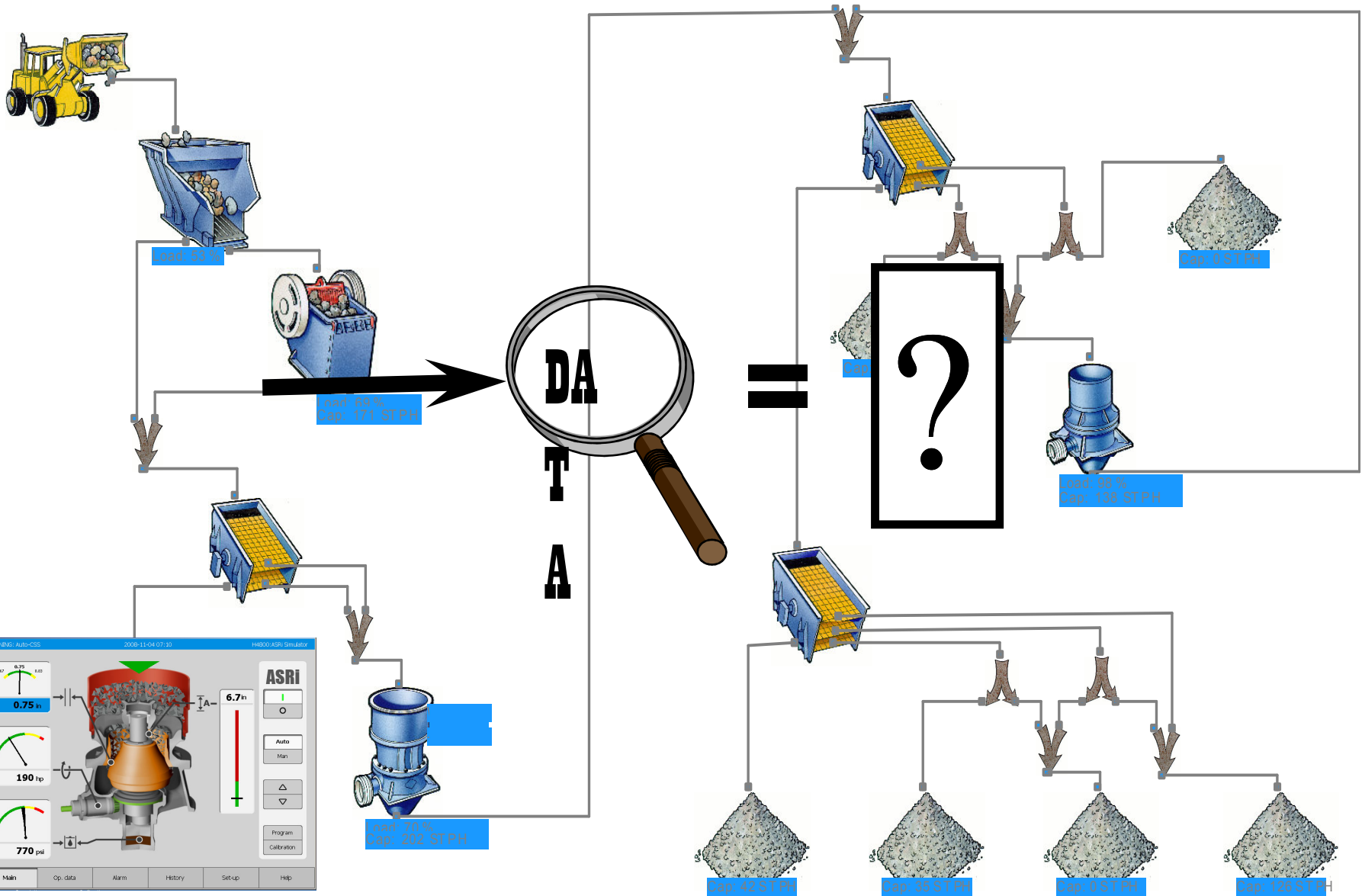
Better Feed





Quality = \$





DA
T
A

RUNNING: Auto-CSS 2008-11-04 07:30 H4800 ASRI Simulator

ASRI

0.75 in

190 hp

770 psi

6.7 in

Auto

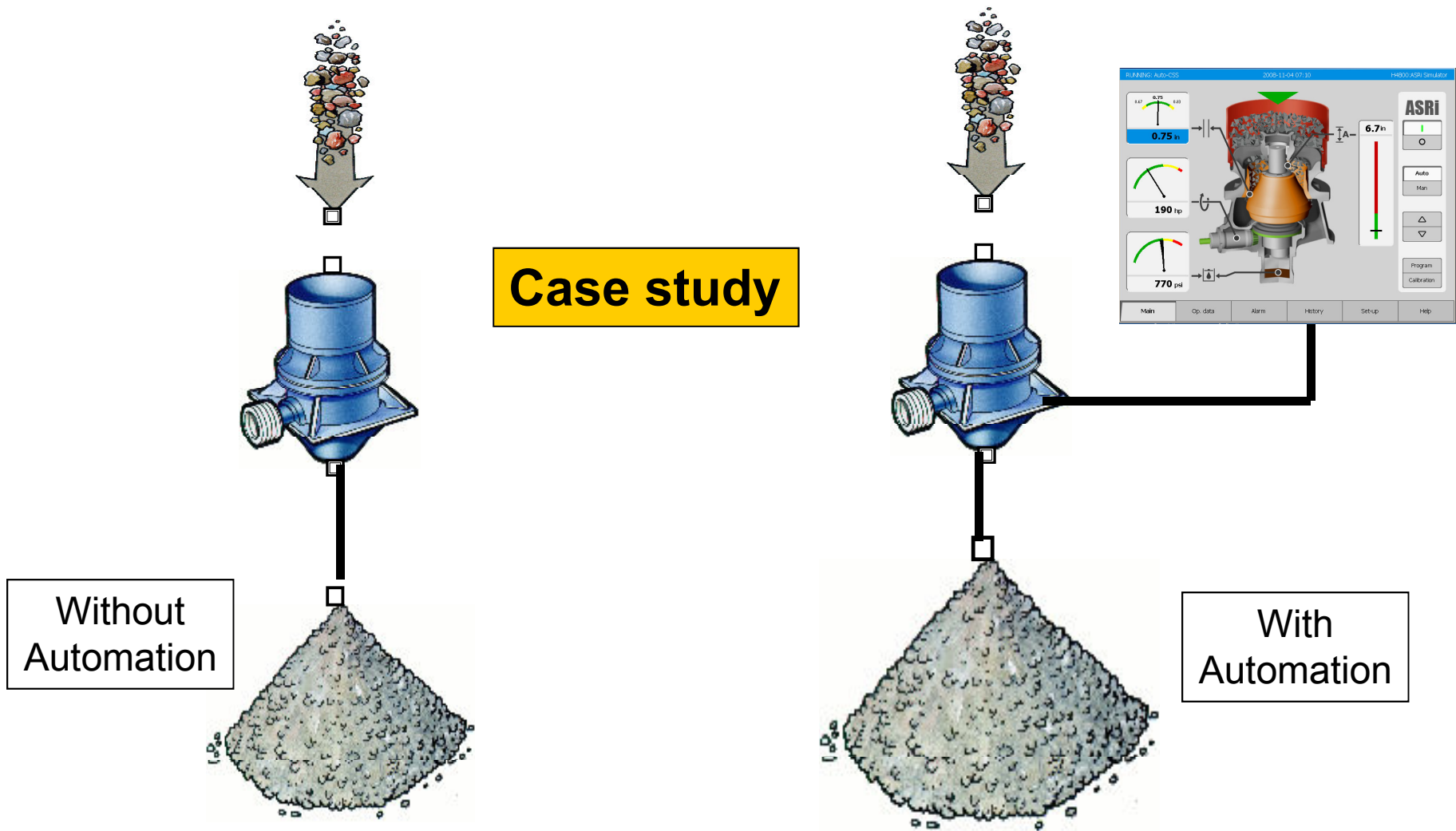
Man

Program

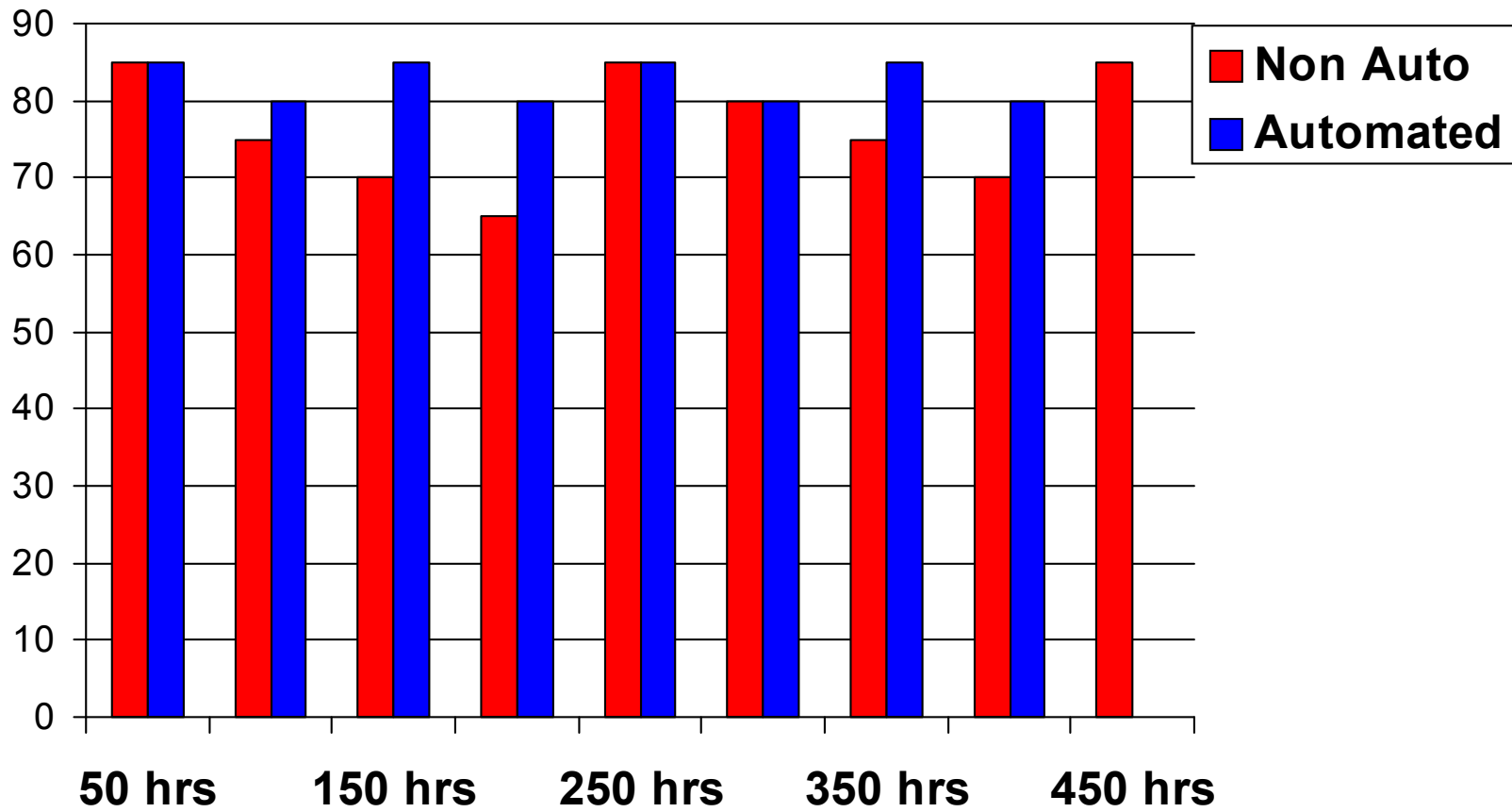
Calibration

Main Op. data Alarm History Set-up Help

Automation can work for you



Crusher Discharge % available minus 1/2 "

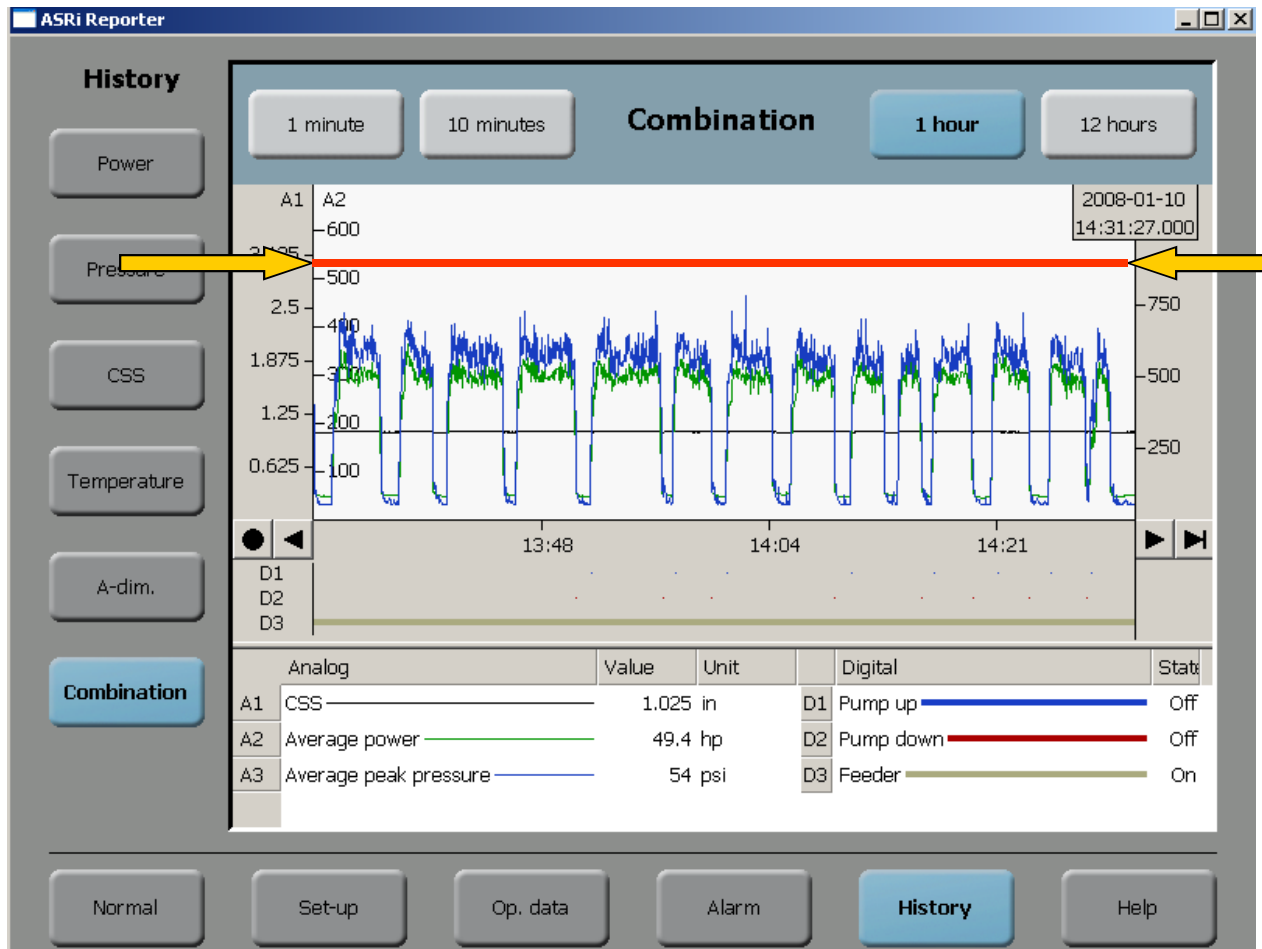


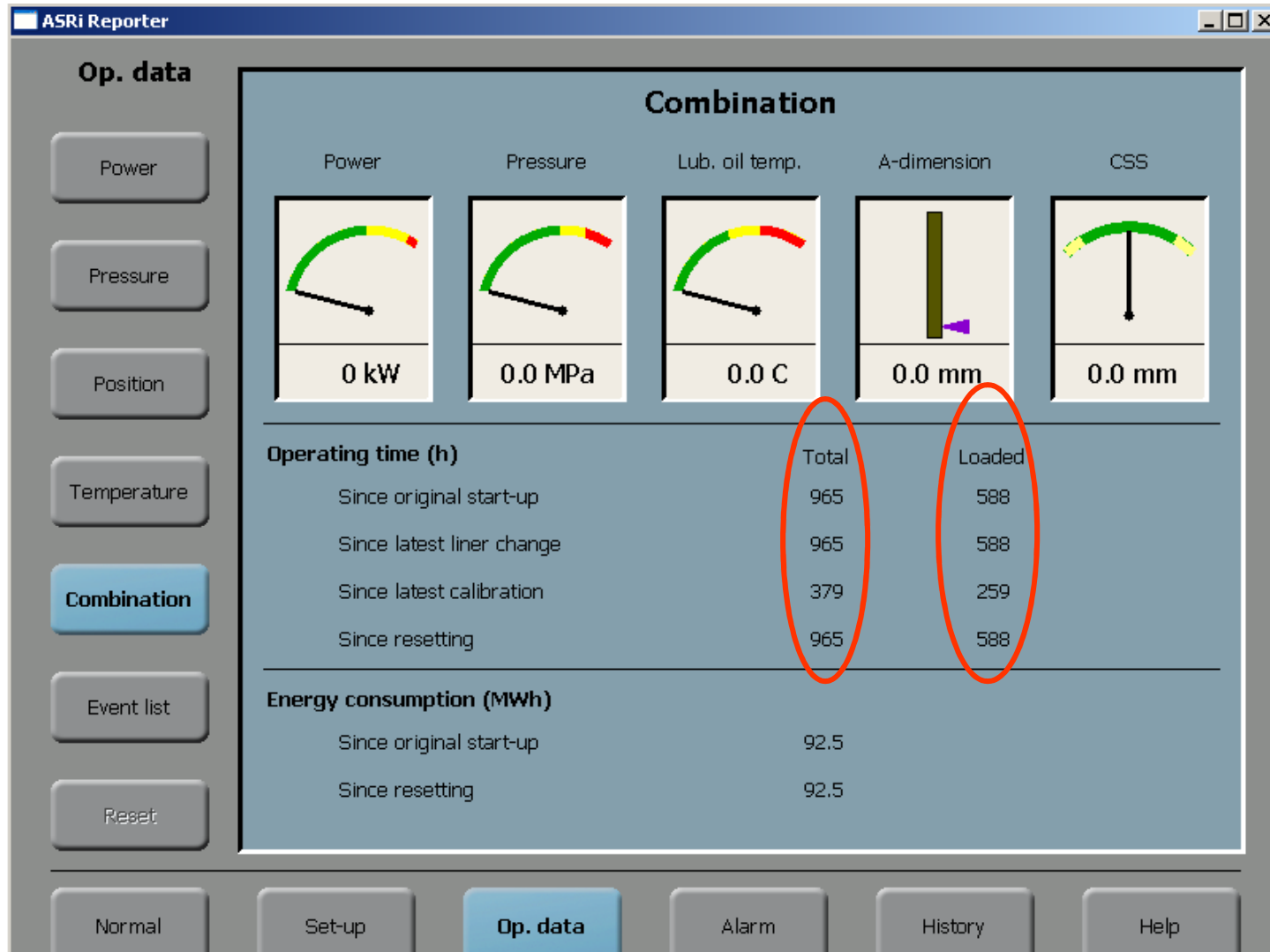
The advantages



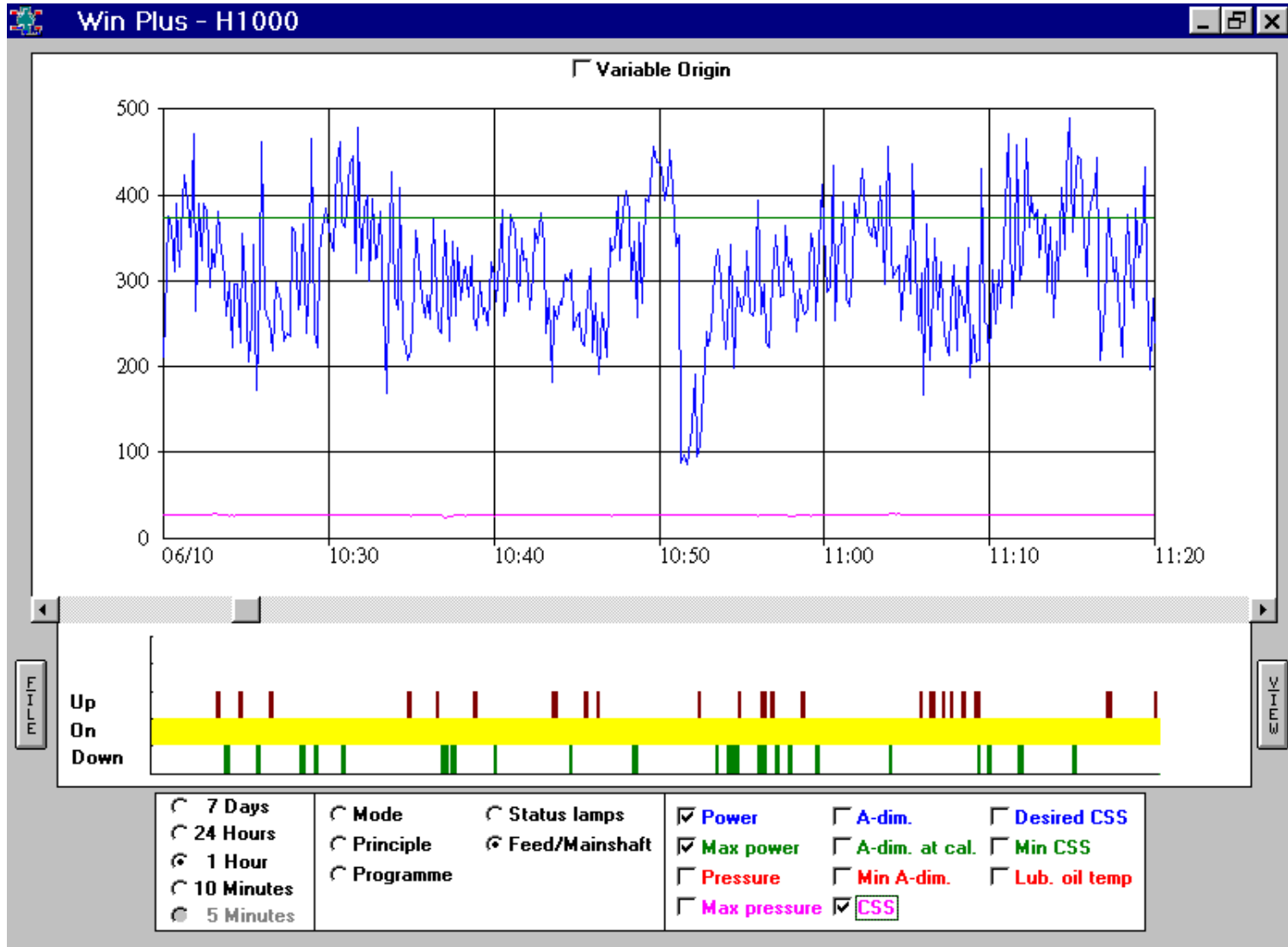
- Can operate choke-fed and utilize the maximum motor power.
- The reduction increases.
- The product shape gets better
- The liner life increase
- Mechanical life of components & machine increase
- Overloading protections
- An automated crusher looks after it self

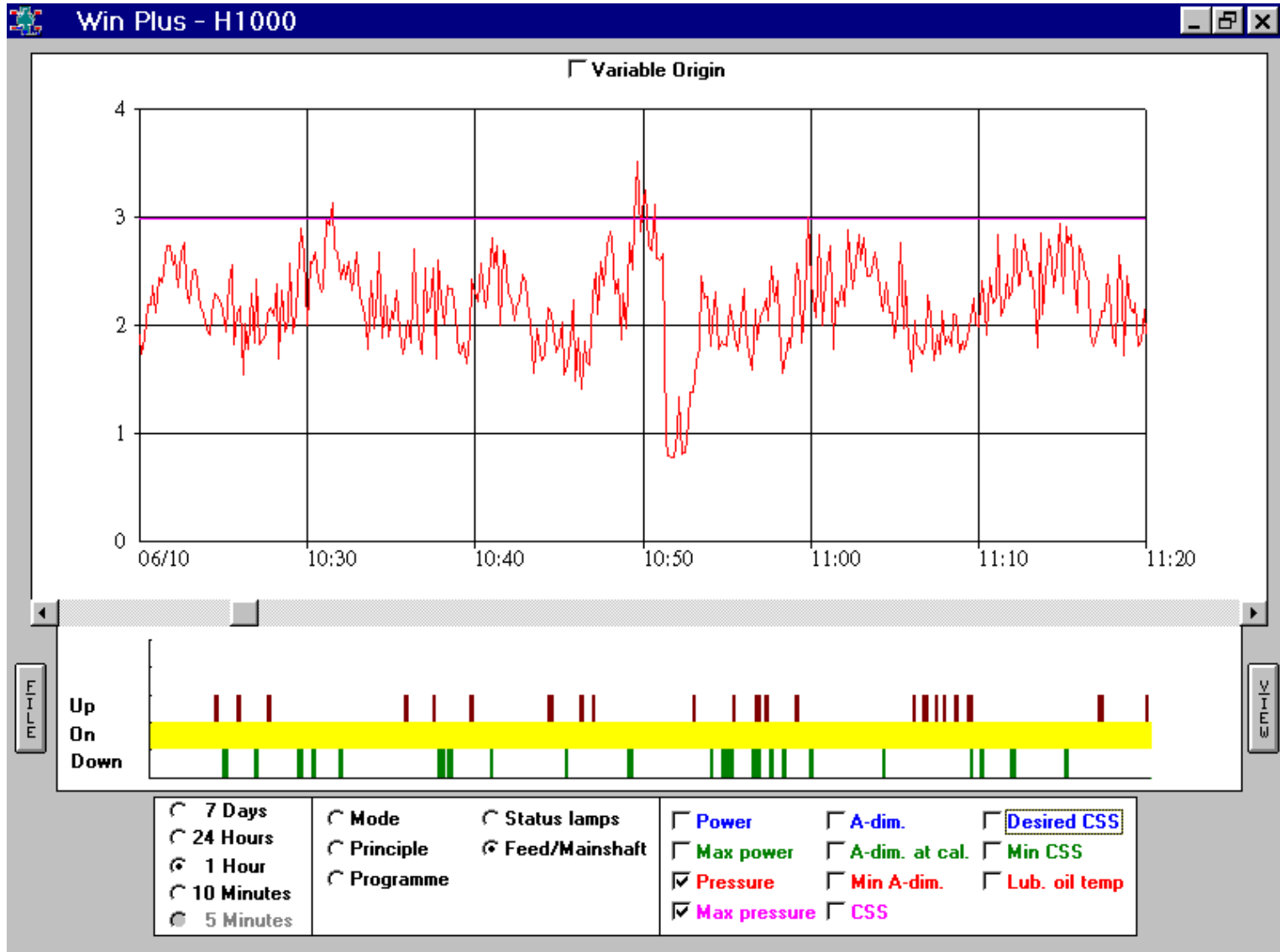
Automation crusher produces 10 tons more of desired product and 33 tons less over size





Loaded 66% of each hour





Summary

- **In summary automation of a compression crusher will provide:**
- **Higher net production of desired products**
- **Optimum utilization of motor power**
- **Continuous adjustment of setting to compensate for feed conditions.**
- **Full utilization of the units capacity**
- **Constant overload protection**
- **The ability to analyze operating data**
- **The opportunity to monitor the unit from remote location.**

FUTURE DEVELOPMENTS

The new handheld, high performance computers will give remote access and allow distant control through mobile phones and Internet. It may be possible to for example to control an automated mobile cone crusher from an office, using a hand held computer, on the other side of the globe. (Bill Malone)



Future of Automation

There are many on-line size sampling systems available today. Whether by mechanical means, or by photo thechnology.

With this ability to sample it is possible to use a control loop in conjunction with and automated crusher station to complete the system and become closer to full automation.

Service in a box.....?

Automatic wear indication.....?

Automatic Parts Re-Order.....?

Thanks



Context for all Presentations:

- **Why are we presenting the material we propose to cover?**
- **Where does it fit in the value chain?**
- **How does it impact total cost / value enhancement/safety issues?**
- **What is the specific informational take-away for student for application in his quarry?**
- **What does this presentation deliver to the student?**
- **Answer the following questions in the mind of the student:**
 - ✓ **What?** (What is being covered)
 - ✓ **Now What?** (What do I do now with this information)
 - ✓ **So What?** (What is the significance of this knowledge or action)