



Converting **Process** and **Analytical** data to provide Enterprise Manufacturing Intelligence

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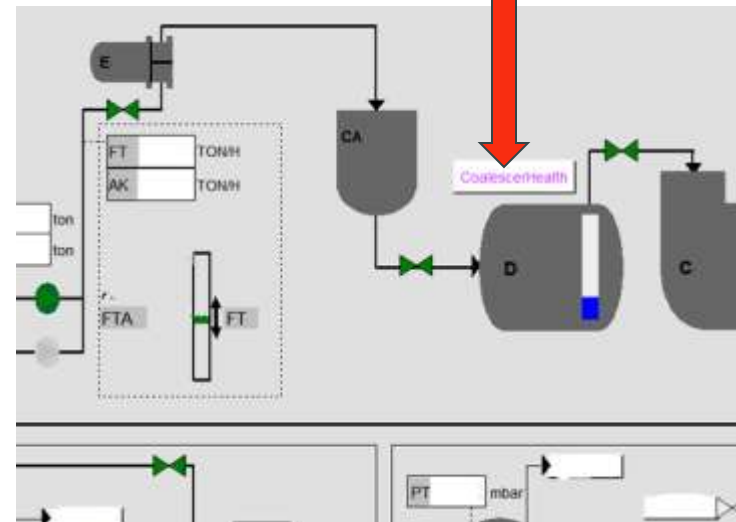
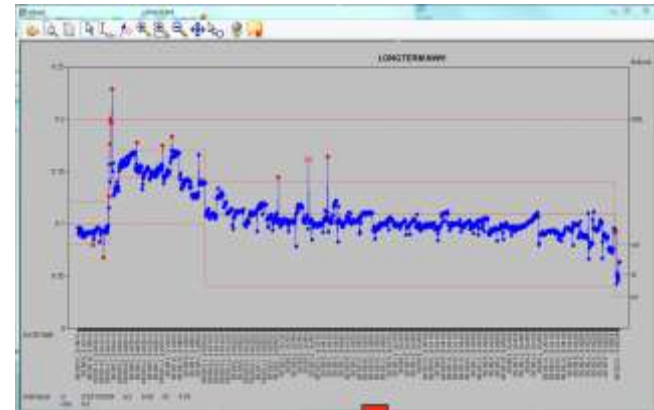
Introduction



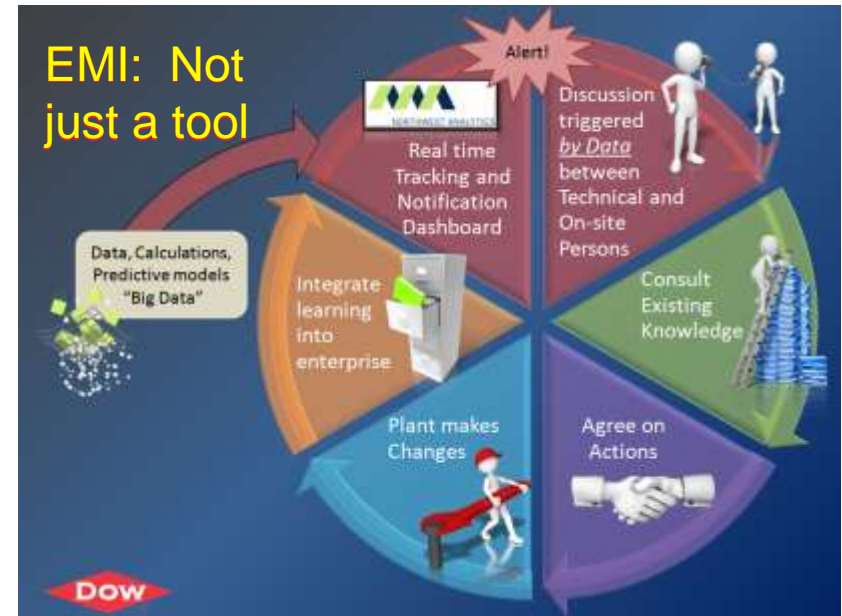
- Big Data Definition I Like Most:

–“Analyzing data that was previously ignored because of *technology limitations*.”
(Matt Aslett, 451 Research)

- Data exist...
- Accessible..
- Contextualize..??
- Make it actionable..??



Enterprise Manufacturing Intelligence (EMI) in Dow at different levels



Tools is one thing.

But how to make (big) data speak?



EMI – what's that?



- EMI
 - SPC¹⁾ is routinely used in M&E²⁾
 - A key development: addition Dashboard capability
- “Complexity made simple” – (LEAN principle):
 - Data access
 - Dashboard view with operational limits
 - Providing context
 - Capturing of comments and observations for sharing
- More than a data tool: **EMI is a philosophy**



1) SPC = Statistical Process Control
2) M&E = Manufacturing & Engineering



80 instruments, 350 components...

As such, cost of measurement = limited.
But the result has a message = big value

Name	Last Value	Specs	SPC	Risk	Functions
ST0001_01_STD_LU_LK09					Chart
ST0002_01_STD_LU_LK09					Chart
ST0003_01_STD_LK02					Chart
ST0004_01_STD_LK02					Chart
ST0005_01_STD_LK02					Chart
ST0006_01_STD_LK02					Chart
ST0007_01_STD_LK02					Chart
ST0008_01_STD_LK02					Chart
ST0009_01_STD_LK02					Chart
ST0010_01_STD_LK02					Chart
ST0011_01_STD_LK02					Chart
ST0012_01_STD_LK02					Chart
ST0013_01_STD_LK02					Chart
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ST0015_01_STD_LK02					Chart
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ST0027_01_STD_LK02					Chart
ST0028_01_STD_LK02					Chart
ST0029_01_STD_LK02					Chart
ST0030_01_STD_LK02					Chart
ST0031_01_STD_LK02					Chart
ST0032_01_STD_LK02					Chart
ST0033_01_STD_LK02					Chart
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ST0050_01_STD_LK02					Chart

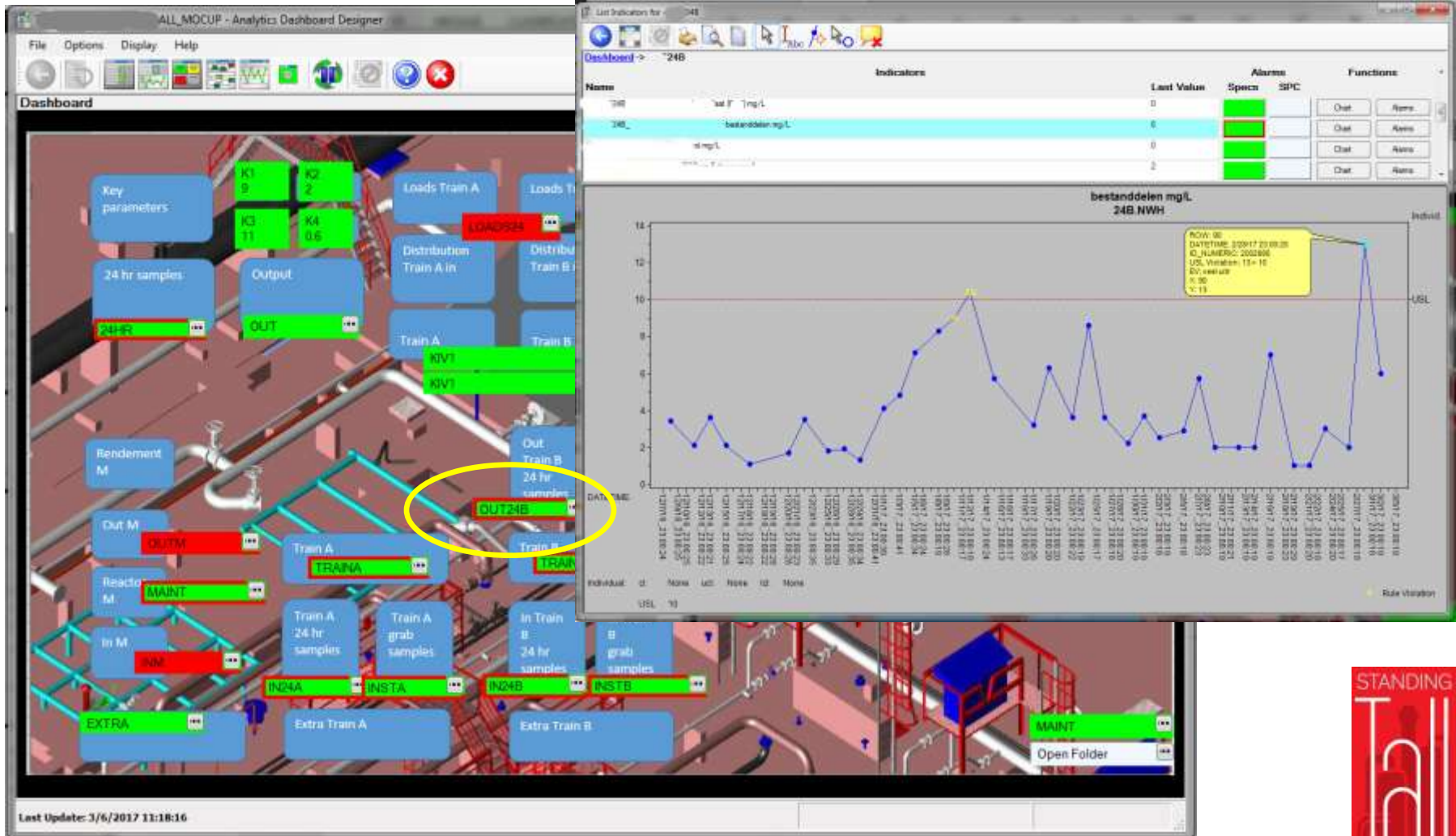


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ST0049_01_STD_LK02					Chart
ST0050_01_STD_LK02					Chart

Name	Last Value	Specs	SPC	Risk	Functions
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8T0032_01_STD_LU_LK09_C2 ppm_val	100.702				Chart
8T0032_01_STD_LU_LK09_C3 ppm_val	106.609				Chart
8T0032_01_STD_LU_LK09_C4 ppm_val	144.080				Chart
8T0032_01_STD_LU_LK09_C5 ppm_val					Chart
8T0032_01_STD_LU_LK09_C6 ppm_val					Chart
8T0032_01_STD_LU_LK09_C7 ppm_val					Chart
8T0032_01_STD_LU_LK09_C8 ppm_val					Chart
8T0032_01_STD_LU_LK09_C9 ppm_val					Chart
8T0032_01_STD_LU_LK09_C10 ppm_val					Chart
8T0032_01_STD_LU_LK09_C11 ppm_val					Chart
8T0032_01_STD_LU_LK09_C12 ppm_val					Chart
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8T0032_01_STD_LU_LK09_C15 ppm_val					Chart
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8T0032_01_STD_LU_LK09_C33 ppm_val					Chart
8T0032_01_STD_LU_LK09_C34 ppm_val					Chart
8T0032_01_STD_LU_LK09_C35 ppm_val					Chart
8T0032_01_STD_LU_LK09_C36 ppm_val					Chart
8T0032_01_STD_LU_LK09_C37 ppm_val					Chart
8T0032_01_STD_LU_LK09_C38 ppm_val					Chart
8T0032_01_STD_LU_LK09_C39 ppm_val					Chart
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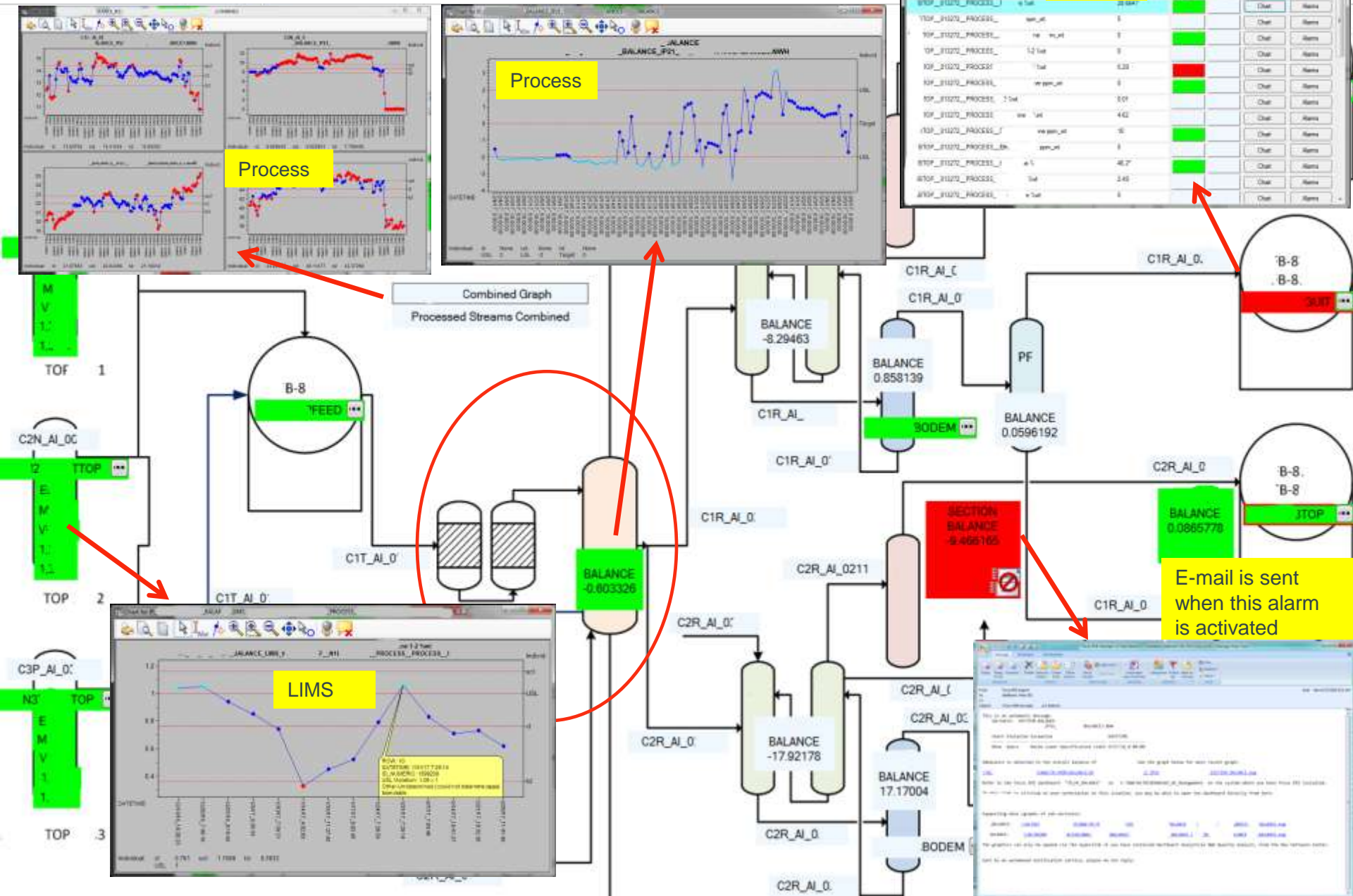
Lab data in action



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Process and LIMS data together



Where EMI is recognized and valued



Implementation

Since 2012 we have completed 60 deployments across the company and in various businesses

Broad spectrum of themes:

- Just lab data
- Pure SPC/SQC
- Process overview
- Critical topic management
- Product quality reporting
- Observation documentation
- Monitoring with multivariate models

Value generation in general:

- 2015 Manufacturing Leadership Award (ROI > 100 MM\$)



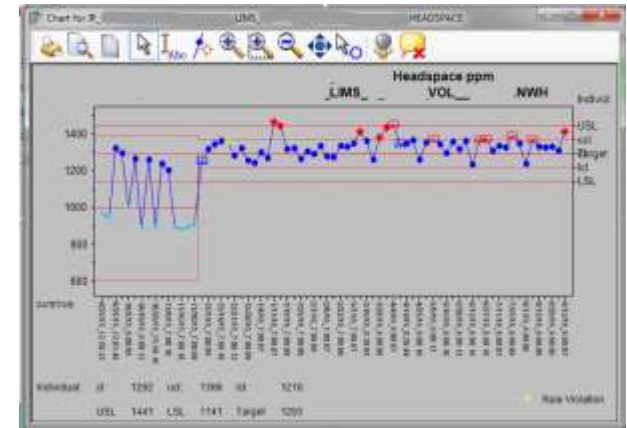
- The ARC External consulting firm evaluated the potential for EMI in the chemical industry. They valued it at 1-2 Million USD per plant. “Everywhere we’ve worked to get a value number, it has never been less than 10 times that!”
- Analyzing data that was previously ignored because of *technology limitations*
- Culture change: review calibrations each *day* instead of *monthly*
- The hidden value of each analytical result



Summary of our efforts



- EMI seamlessly connects to IP21, LIMS and other databases
- Condensing vetted knowledge into a structure – *it is a philosophy*
- Providing context to data, and (SPC) limits
- More eyes watching the data
UNLOCK knowledge of the QC analyst
- Fast & Flexible set-up – highly automated
- Broadly used across businesses – and growing. Filling a clear gap.



Necessary for success



- Right vision needed at top leadership level to overcome some hurdles, like
 - ‘We have that already’
 - Implementation/training is an effort
 - Silos exist
- Support structure
 - Standardization
 - Training
 - Optimization
 - Automation
 - *There are headwinds*
- Entrepreneurs that go for the value
 - Pulling, pushing, telling, showing, preaching...

