FREEPORT-MCMORAN COPPER & GOLD

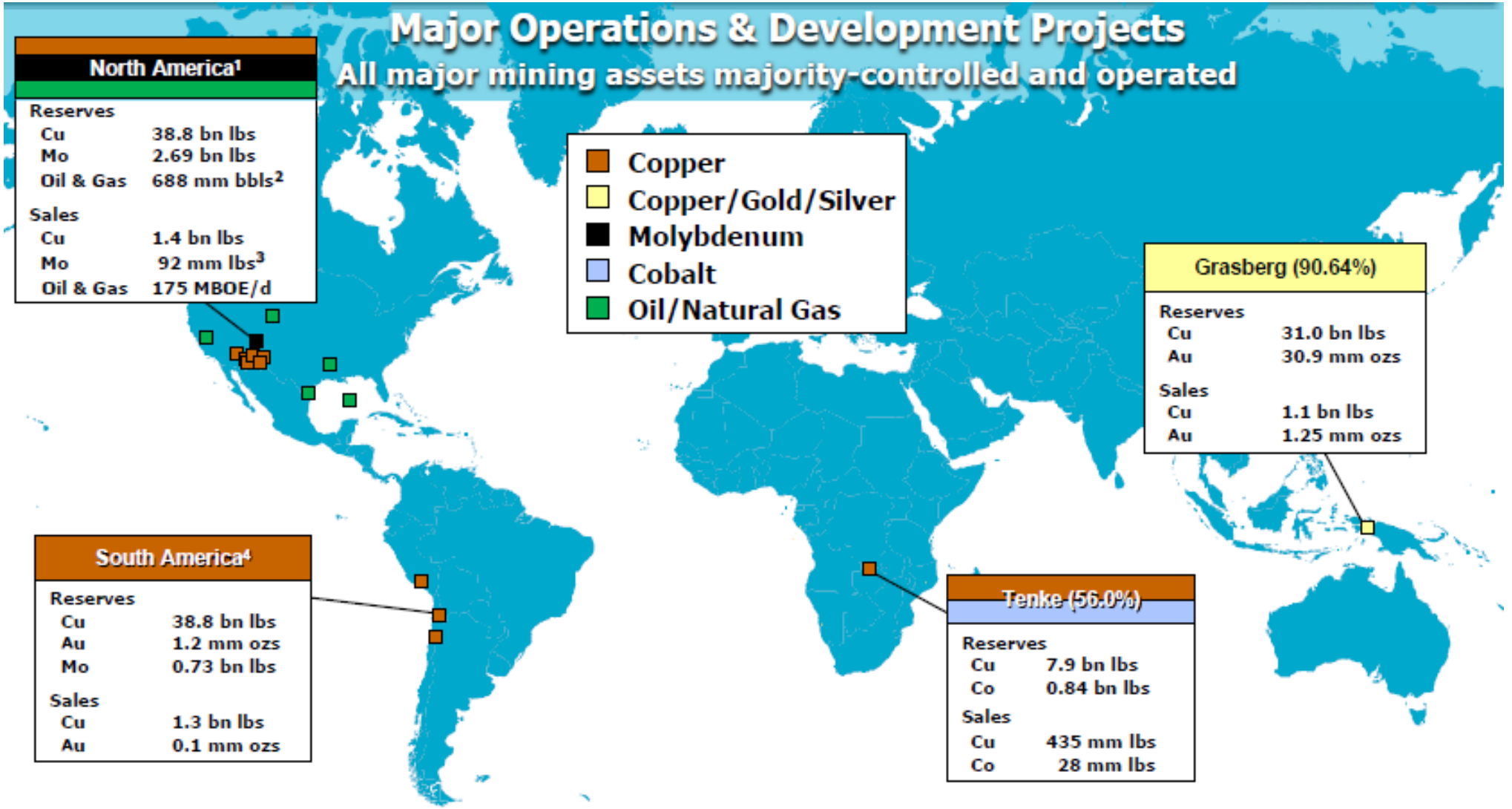
EXPANDING RESOURCES

Building an "Enterprise" PI System

How Freeport-McMoRan is delivering an enterprise class machine data access solution.

www.fcx.com

FCX Global Footprint



Issues we face…

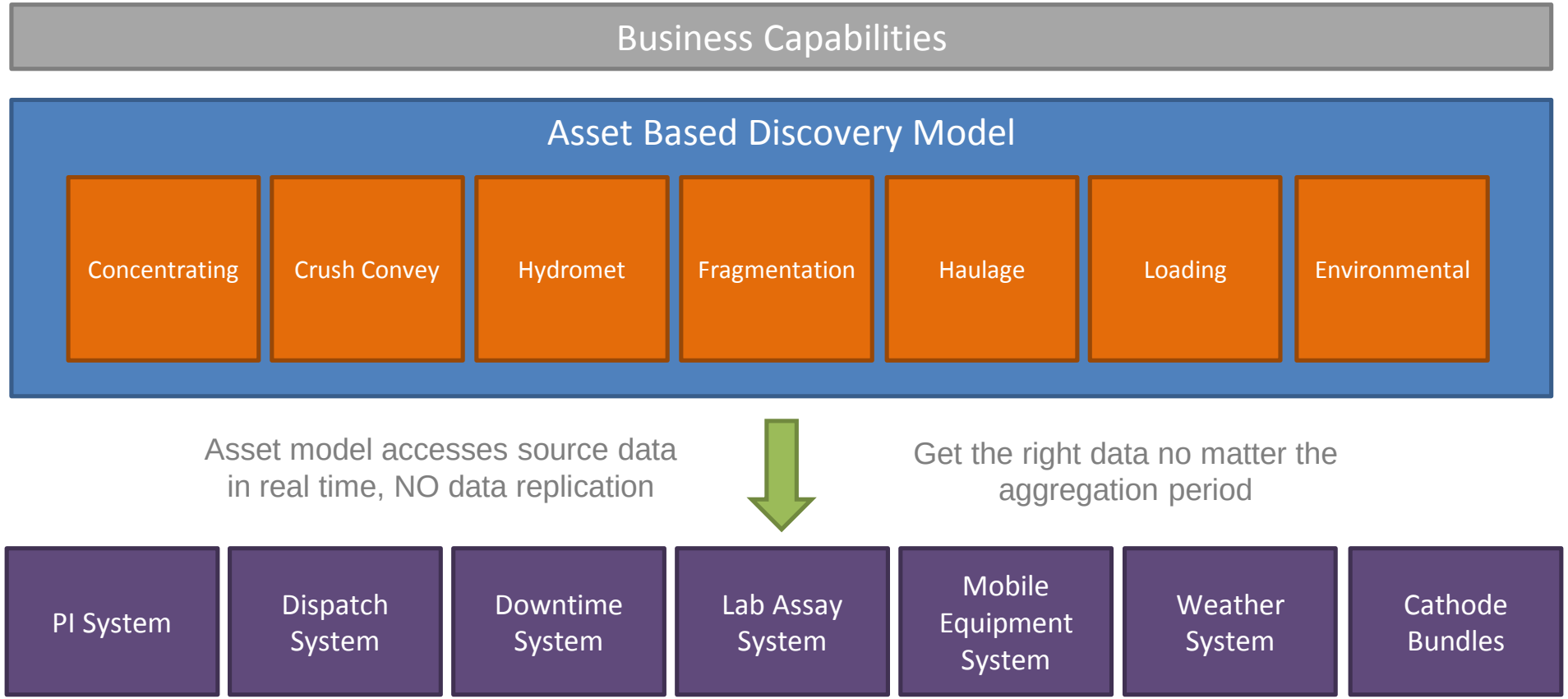
- Workforce rollover
- 15+ data historians across the globe, all implemented, managed independently
- How do we integrate the historian infrastructure with existing enterprise investments to deliver services that increase business value.
- Constant pressure to decrease administrative costs

What are our goals?

- Build a global common vocabulary
- Deliver web and mobile capabilities
- Enable users to leverage existing enterprise investments with no local infrastructure
- Maintain operations ability to quickly respond to local needs
- Deliver it all in a way that creates a global PI System community

Asset Based Model is the hub…

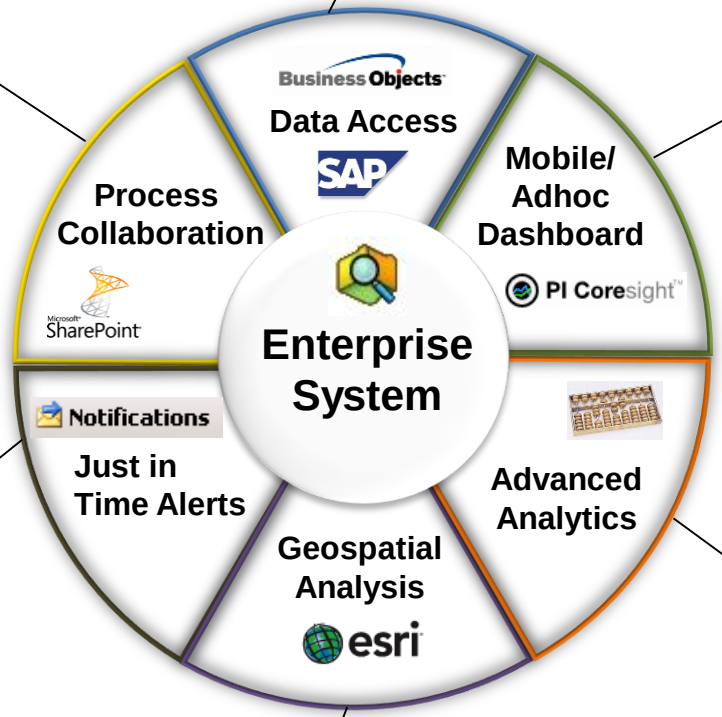
- Builds a common vocabulary: Stop talking about servers and tags, start talking about assets, measures, and events
- Provides relational model that enables delivery of enterprise class services



From the hub, we extend capabilities

- OLEDB Enterprise enables integration with our Business Objects reporting environment, giving us the ability to create easily reproducible reports that can be sent out automatically
- Integration with SAP enables real time transfer of machine information such as service hours

- Using Webparts we can publish Processbook graphics to the web
- SharePoint allows us to bring all these capabilities together and present them as one feature set.



Coresight Enables:
- Quick Interactive dashboarding for adhoc collaboration
- Enables the curious user to find the data they need without extensive training
- Allows us to display dashboards on mobile devices

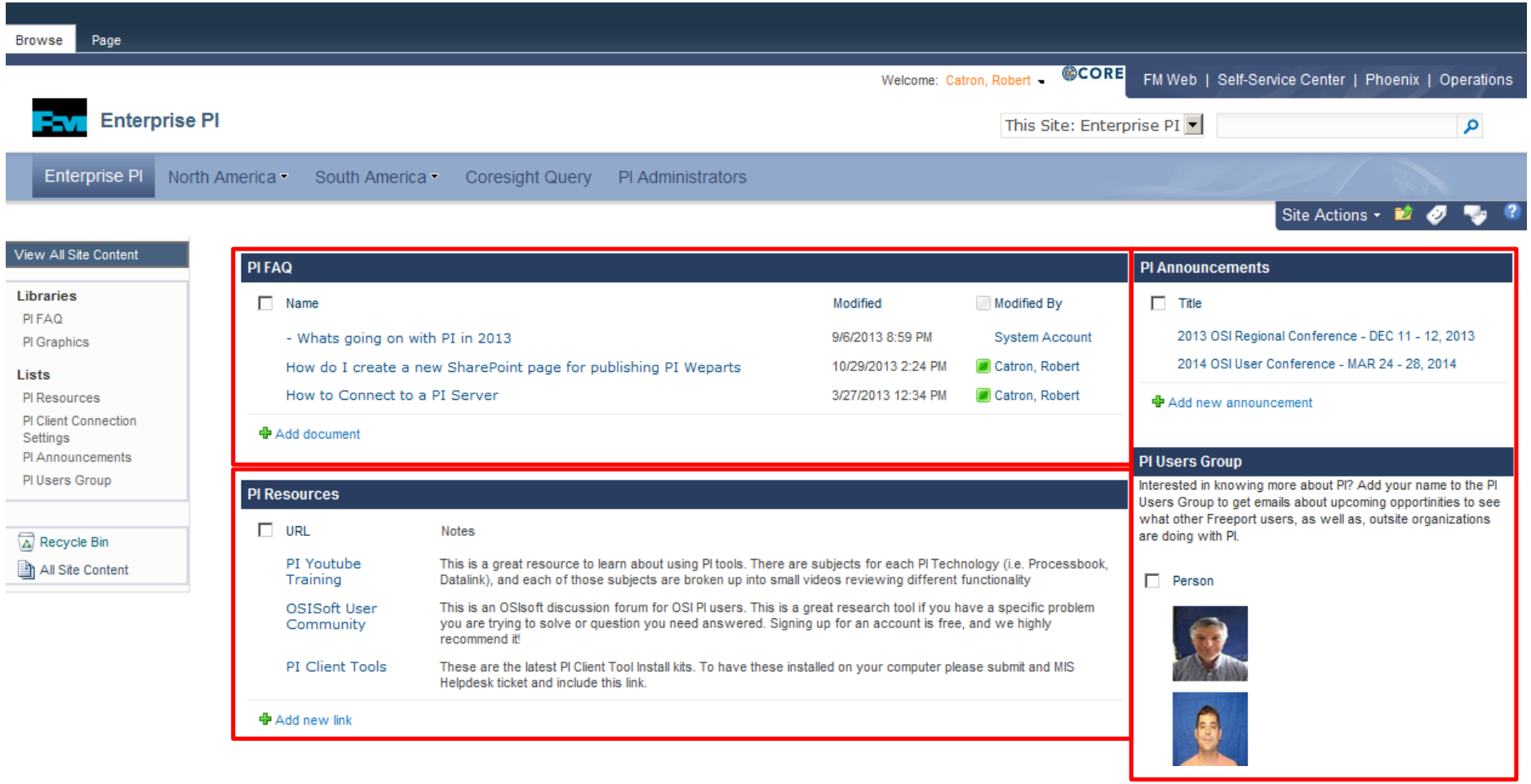
Notifications evaluates data in real time and alerts operators to problems as they occur.

Asset Based Analytics allows rules-based event generation and calculation authoring, a key component to operationalizing Big Data.

Analyze your data Geospatially:
- View Truck and Shovel Locations in Real Time
- Fuel Burn Heat Map, based on haul routes, to improve road maintenance
- Analyze real time weather data
- This is a whole new world, the possibilities are only limited by our imagination

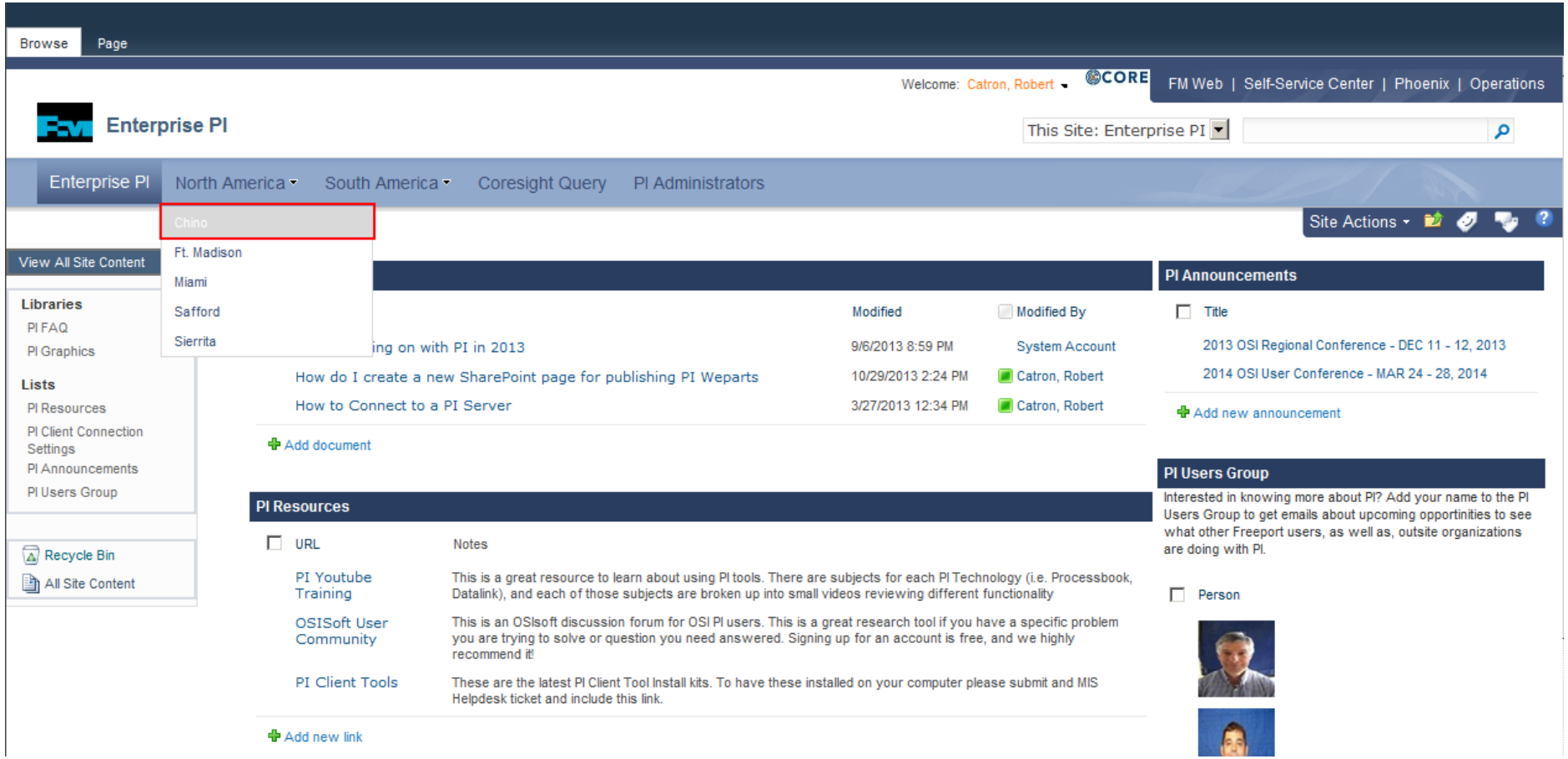
Capabilities delivered from integrated experience

- The SharePoint home page delivers general information, self help resources, and communication to our user community



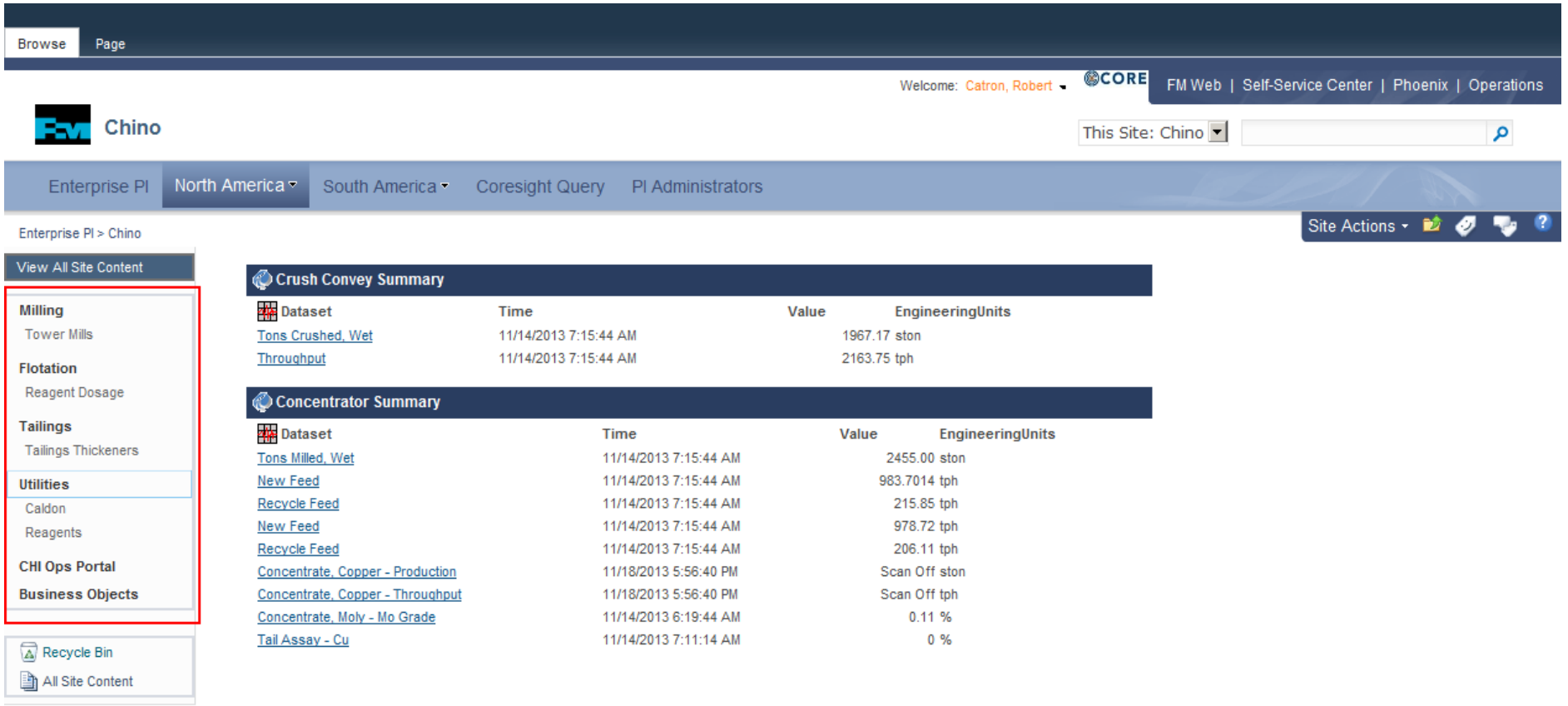
Capabilities delivered from integrated experience

- Using the dropdown menus a user can navigate to any operations page



Capabilities delivered from integrated experience

- Now you have a series of links to visualizations the operation has published

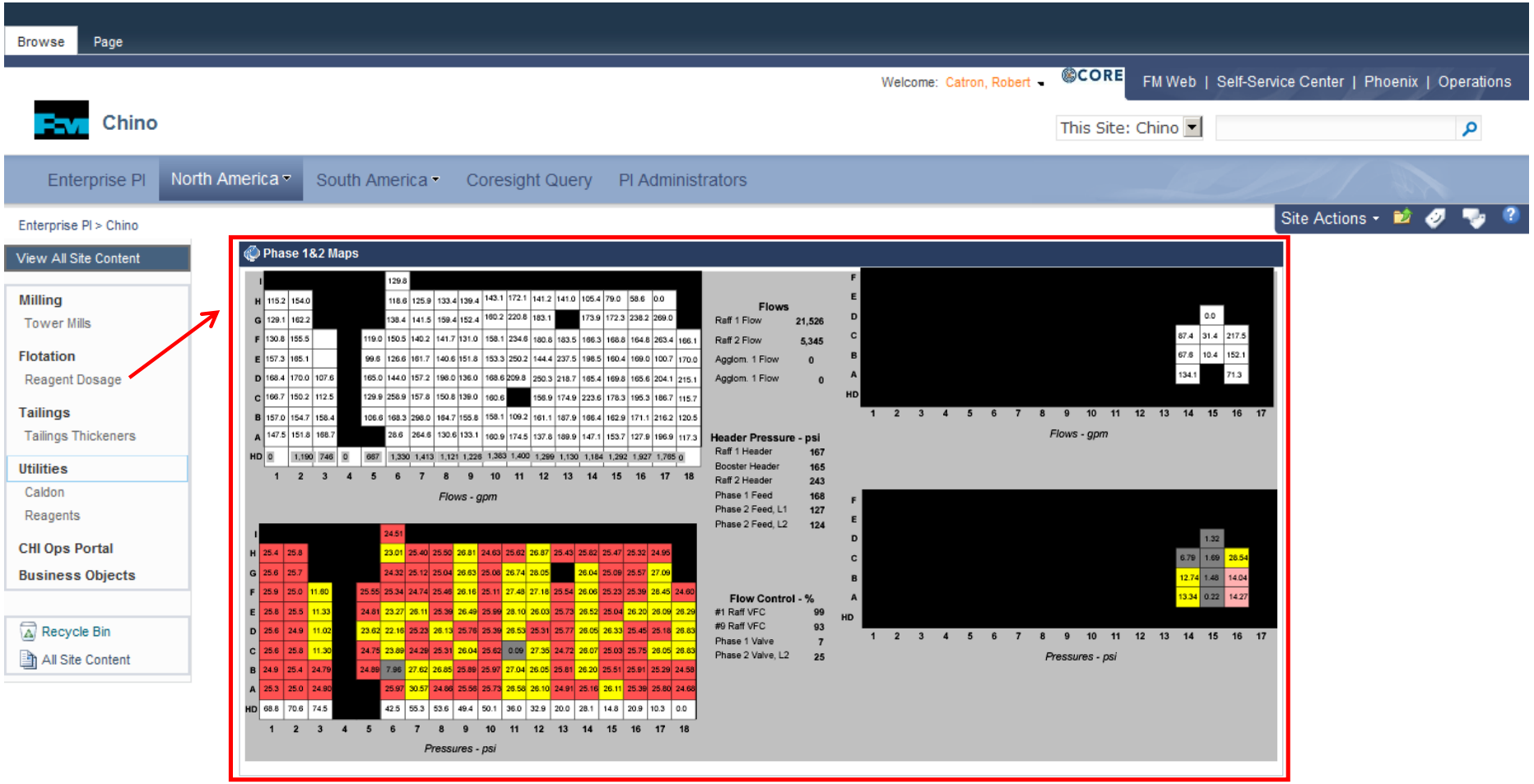


Capabilities delivered from integrated experience

- By clicking on the first link I bring up a dashboard built on Coresight

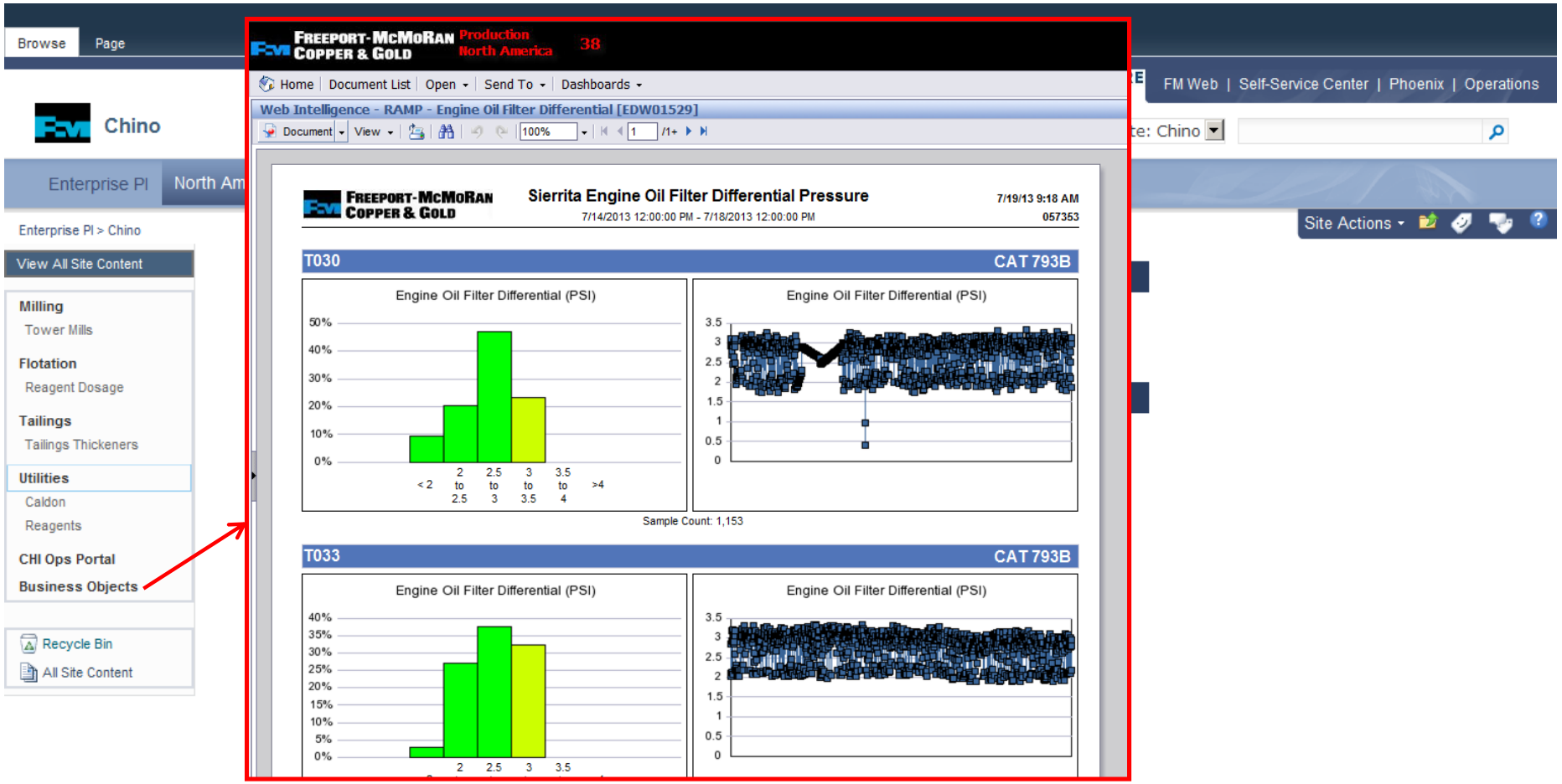
Capabilities delivered from integrated experience

- By clicking on the next link I bring up a process graphic

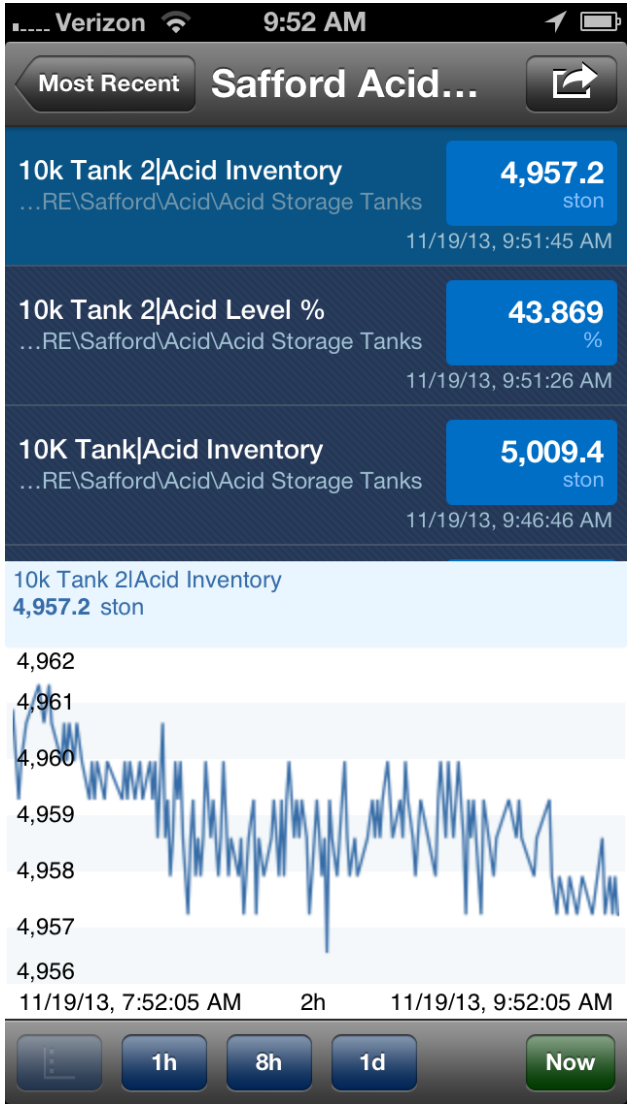


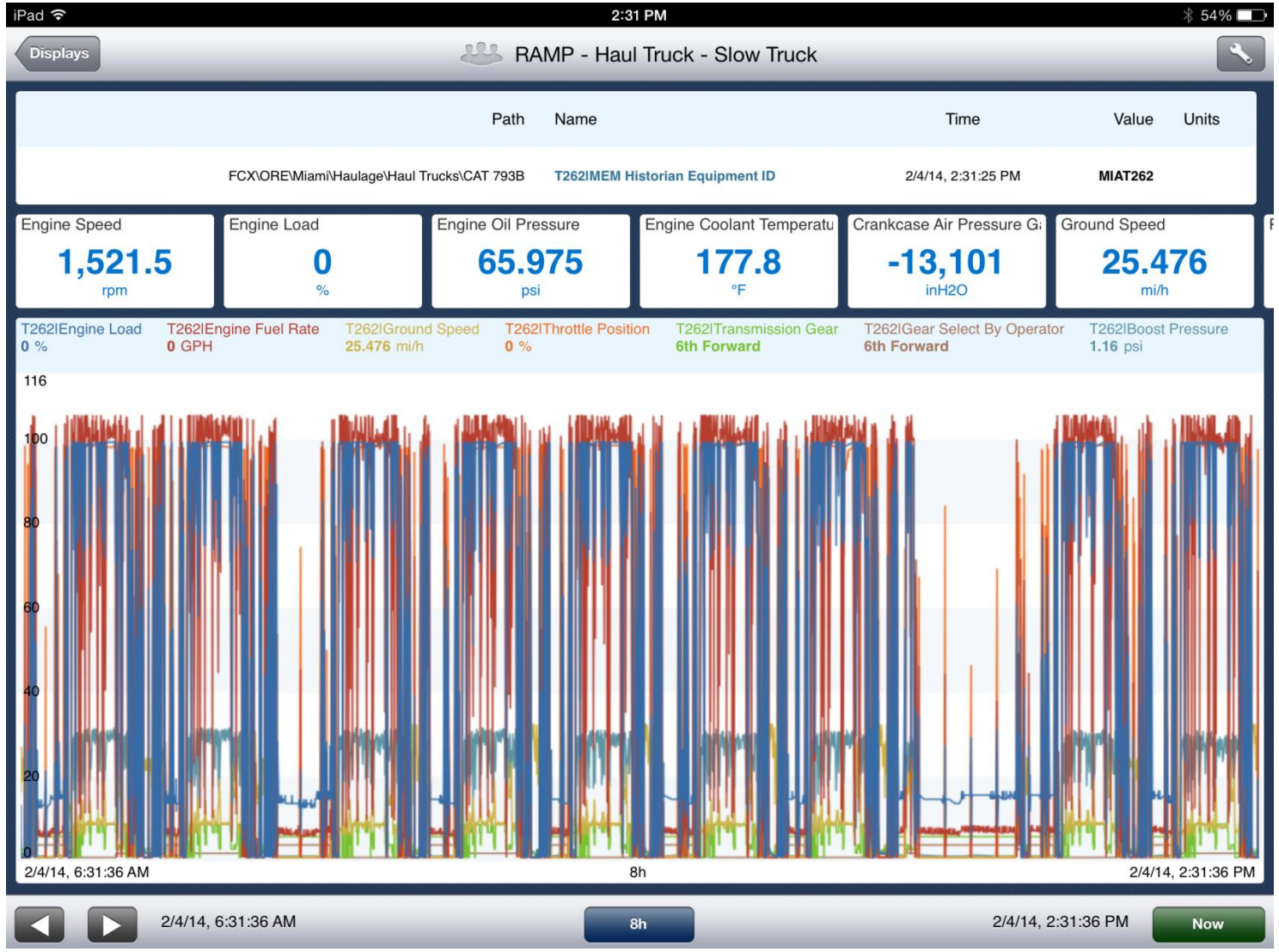
Capabilities delivered from integrated experience

- Clicking on another link brings up a report created in Business Objects



Mobile capabilities keep operators in the field





Are we accomplishing our goals?

- Build a global common vocabulary

  Using Asset Framework we deliver a common vocabulary across the organization.

- Deliver web and mobile capabilities

  Using Coresight and WebParts we delivered analytic capabilities via the web and iDevices

- Enable users to leverage existing Enterprise investments with no local infrastructure

  Using AF and OLEDB Enterprise we leveraged our existing Business Intelligence environment to deliver a robust reporting solution

Are we accomplishing our goals?

- Maintain operations' ability to quickly respond to local needs

  Using ProcessBook and DataLink operations can continue to respond to local analytical needs as they arise

- Deliver it all in a way that creates a global PI System Users community

  Using SharePoint we were able to deliver all of this with an integrated user experience that fosters global collaboration

An Example of Business Value

- Identifying/Prioritizing Haul Truck Engines Cylinder Kit Failures
  - Problem: Over time an engines Cylinder Kit degrades, causing the differential filter pressure to rise.
    - If this issue is not addressed it can cause catastrophic failure of the Engine resulting in a $180,000 core value loss.
    - While we have real time monitoring in place to prevent catastrophic failure, early detection is key to efficient maintenance planning and overall equipment health.

How do we identify equipment with chronic cylinder issues, so that we can proactively prioritize maintenance and bring the truck down in a controlled manner.

An Example of Business Value

- Solution: Using Business Objects, connected to our machine data, we created a daily report that prioritizes trucks by their cylinder health.

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Sierrita Engine Oil Filter Differential Pressure

12/7/2013 12:00:00 PM - 12/8/2013 12:00:00 PM

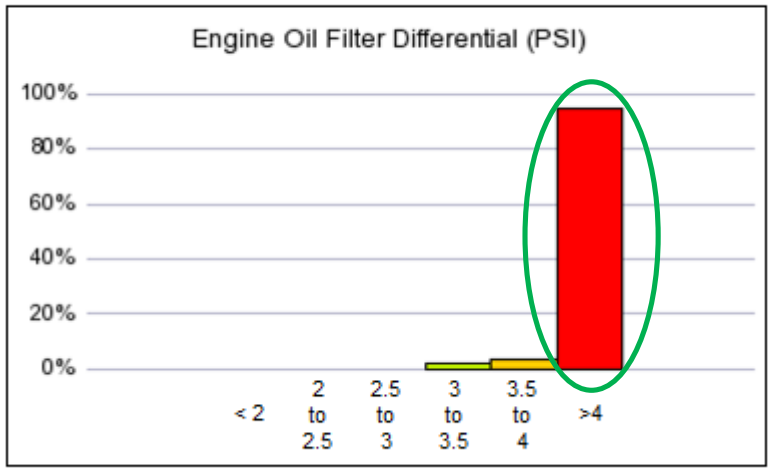
12/9/13 8:55 AM

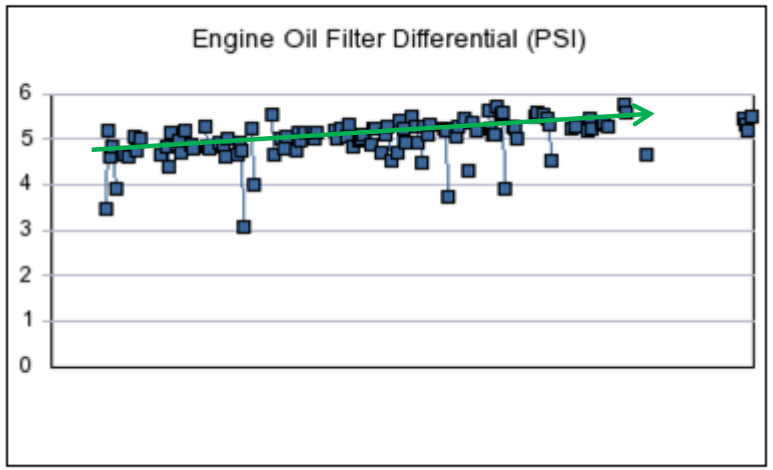
057353

Truck	Fleet	Max Eng Oil Filter Differential Pressure	Avg Eng Oil Filter Differential Pressure	Average Engine Oil Pressure	Sample Count
T062	CAT 793D	5.76	5.01	64.21	114
T063	CAT 793D	5.44	2.69	60.49	7
T036	CAT 793B	4.81	3.81	70.14	85
T034	CAT 793B	4.49	3.6	65.11	90
T073	CAT 793D	3.92	3.4		

This is a summary of all Haul Trucks sorted by Engine Oil Pressure descending, allowing us to quickly identify equipment with a possible cylinder problem.

T062 **CAT 793D**

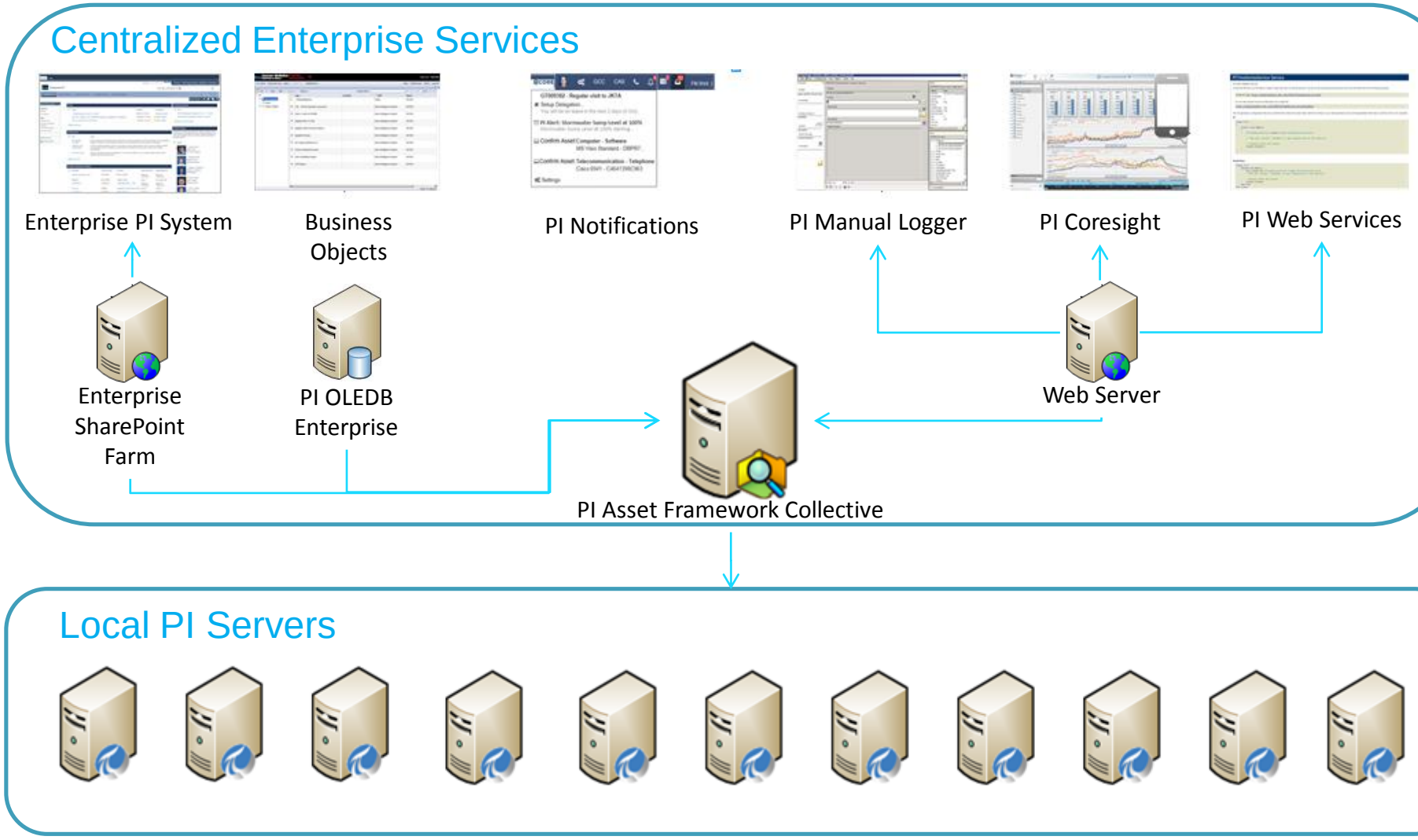




Sample Count: 114

Supporting the summary with detail, I can see the sample distribution and trend…validating the issue and indicating action should be taken

Based on the above maintenance would be scheduled and the Cylinder Kit replaced.

Question and Answer

Appendix – High Level Infrastructure