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USERS²⁰¹¹ CONFERENCE



Turning **insight** into **action**.



Extending Fleet Performance Optimization Strategies

Presented by **David Brill, AVP Asset Management**
Black & Veatch

Agenda

- Black & Veatch and PowerPlantMD[®]
- Typical Struggles with Comparative Analytics
- PowerPlantMD[®] Comparative Analytic Services
- PI System Architecture
- Future Plans and Next Steps

About Black & Veatch



- Global engineering, consulting and construction company
- Energy, water, information and government markets
- Founded in 1915, employee-owned, 90 offices worldwide



- Proactive Solutions to Improved Plant Performance
- Leading Third-Party Monitoring & Diagnostic Center
- Integration platform for strategy, analysis & business intelligence

Business Challenge/Problem Addressed

- *Value of performance rising* due to environmental challenges coupled with regional energy markets becoming more interconnected and accommodating more non-traditional generation assets
- Power generators will need *a more convenient and transparent means* to compare the performance of their assets against other assets within their fleet, against similar units in other fleets, as well as relative performance to the overall market.
- *New form of math needed* to wrestle with the myriad of plant design configurations, non-standard plant data & instrumentation, and non-standard performance calculation protocols.

Existing Information Landscape

- Most performance calculations are focused at the unit, encouraging depth & customization to address unit-specific peculiarities.
- Non-standard performance metrics at the local asset level hinder scalability and information flow to the corporate level.
 - Widely varying quantity and quality of plant instrumentation
 - Huge volume of data content and calculated performance metrics, but with varying quality
 - Plant level analytics not well-suited for generation of centralized metrics/performance views
- Implementation and maintenance of custom calculations across a fleet is resource intensive and can suffer from plant resource constraints.
 - Local use maintained locally, centralized data feed maintained centrally
- Centralized asset comparisons are difficult and, many times nonsensical, due to above factors.

PowerPlantMD[®]



Proactive Issue Identification, Diagnosis, Resolution

- *Real Time Anomaly Detection Process*
- *Long-Term Trend Analysis*
- *Annual Outage Analysis*
- *On Demand Problem Support*
- *Issue Management Web Portal and Knowledge Base*

An information integration & analytic platform:

- Proactive
- Collaborative
- Scalable

to drive bottom-line results!



Fleet-wide Cap/Ops Strategy

Plant Improvement

Fuel Flex Strategy

Operations & Maintenance

PowerPlantMD[®]

ID

Characterize

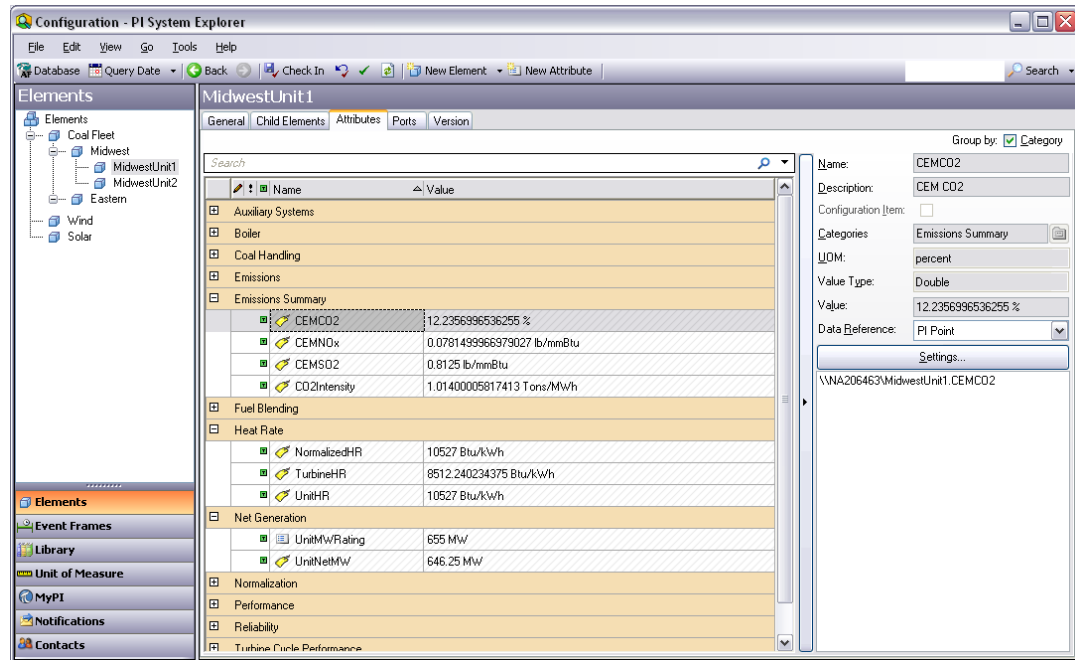
Prioritize

Evaluate

Act

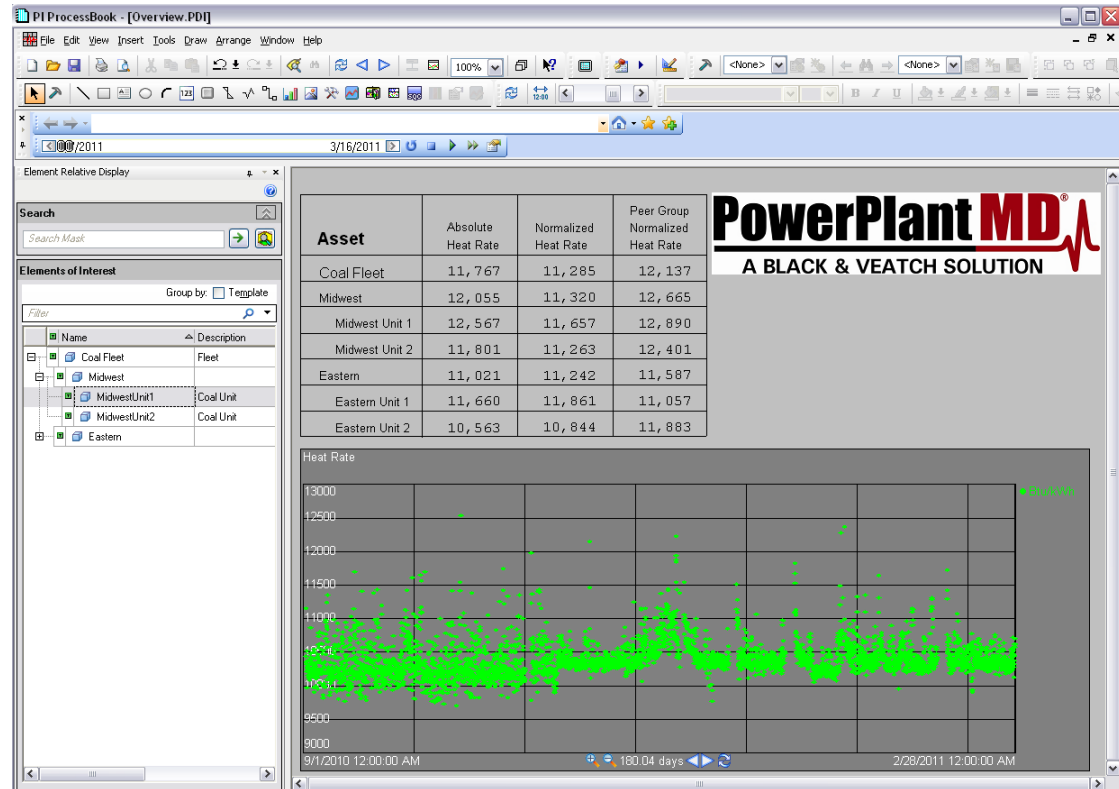
Enabling Structure through PI Asset Framework (PI AF)

- **Hierarchical Structure**
 - Logical organization
- **Template Library**
 - Scalability & rapid deployment
- **Data References**
 - Flexible data connectivity
- **Element Relative Displays**
 - Rapid user interface deployment



PI System Architecture – Hierarchical Performance Views

- PI AF exposes the breadth and depth of the results across and within the fleet.
- Hierarchical Views:
 - Speed deployment
 - Enrich the user experience
 - Provide additional value beyond traditional unit-centric displays



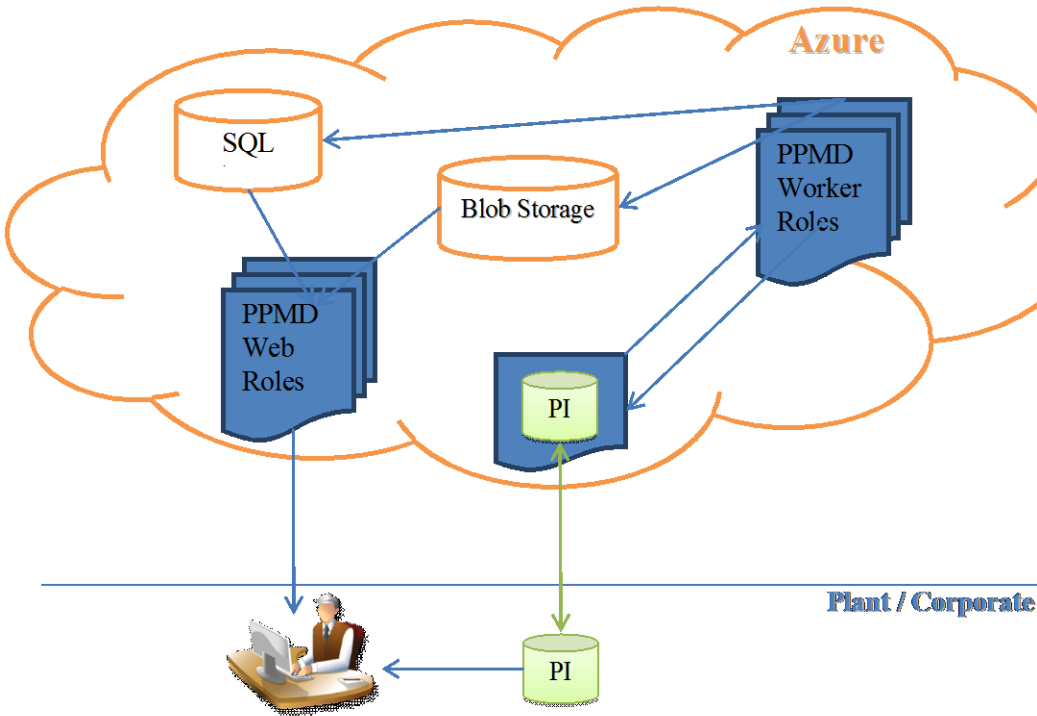
The Challenge of Comparative Analytics

- Analytics implemented at plant not well-suited for generation of centralized metrics/performance
 - Non-standard or “missing” performance metrics at the local asset level hinder scalability and information flow to the corporate level
 - Widely varying quantity and quality of plant instrumentation
 - Huge volume of data content and calculated performance metrics, but with varying quality
- Scale is critical to enable peer-unit analysis
 - Our focus is to enable large scale, rigorous, and efficient structure for calculations
 - Pedigree data needed to identify critical asset attributes: technology, fuel, load, operational
 - Anonymous analytics across assets enables comparison and performance benchmarking
- Robust and secure data infrastructure needed to manage data collection, analysis, and presentation of results
 - Efficiency
 - Environmental
 - Other performance metrics, based on class of asset

Solution – PowerPlantMD[®] Comparative Analytic Services

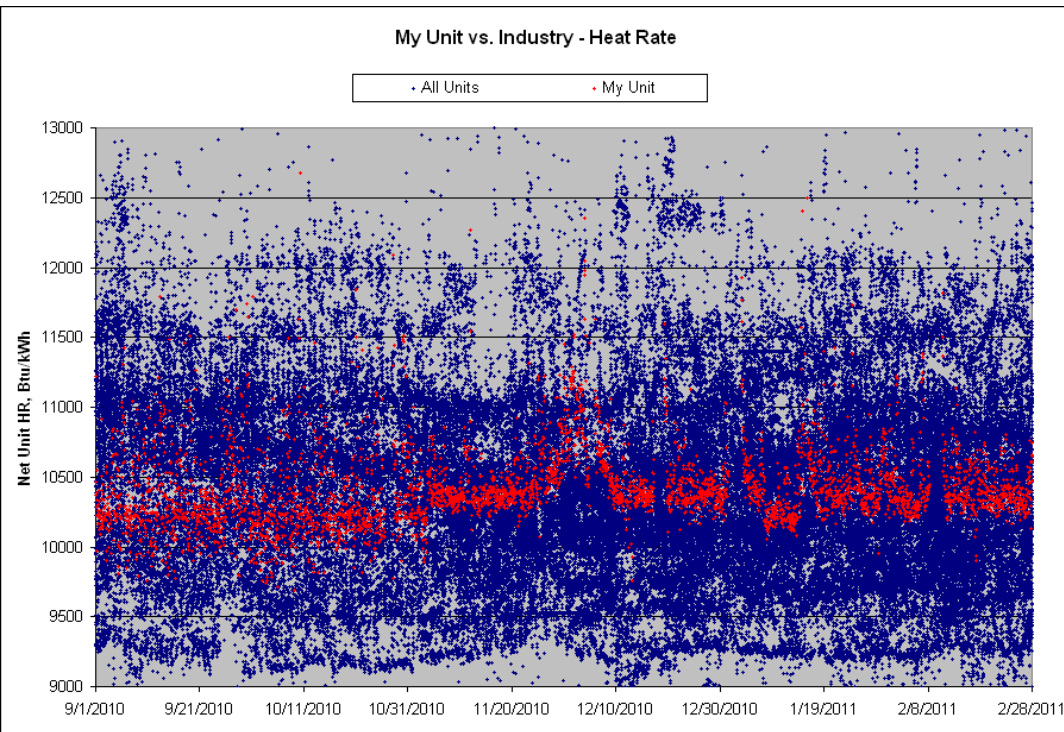
- Black & Veatch, in collaboration with OSIsoft, is offering an extension of our PowerPlantMD[®] platform to provide inter-customer anonymous comparative performance analytics
- Our goal is to further leverage the existing individual customer data available in client PI System archives by developing a set of standardized and normalized performance models, to facilitate a community
- Participants reap the unprecedented value proposition associated with having real time access to a granular peer-group quantification of asset key performance indicators

PI System Architecture for Comparative Analytics



- A secure, multi-client, cloud environment to facilitate a community
- Normalized calculation results sent via PI to PI Interface back to the plant / corporate archives for inclusion in standard PI ProcessBook displays
- Community web interfaces – strategic options analysis based on the insight of not only the customer's own results, but also a data rich peer analysis
 - Performance tracking
 - Target setting
 - Variance analysis

Comparison of Actual Heat Rates

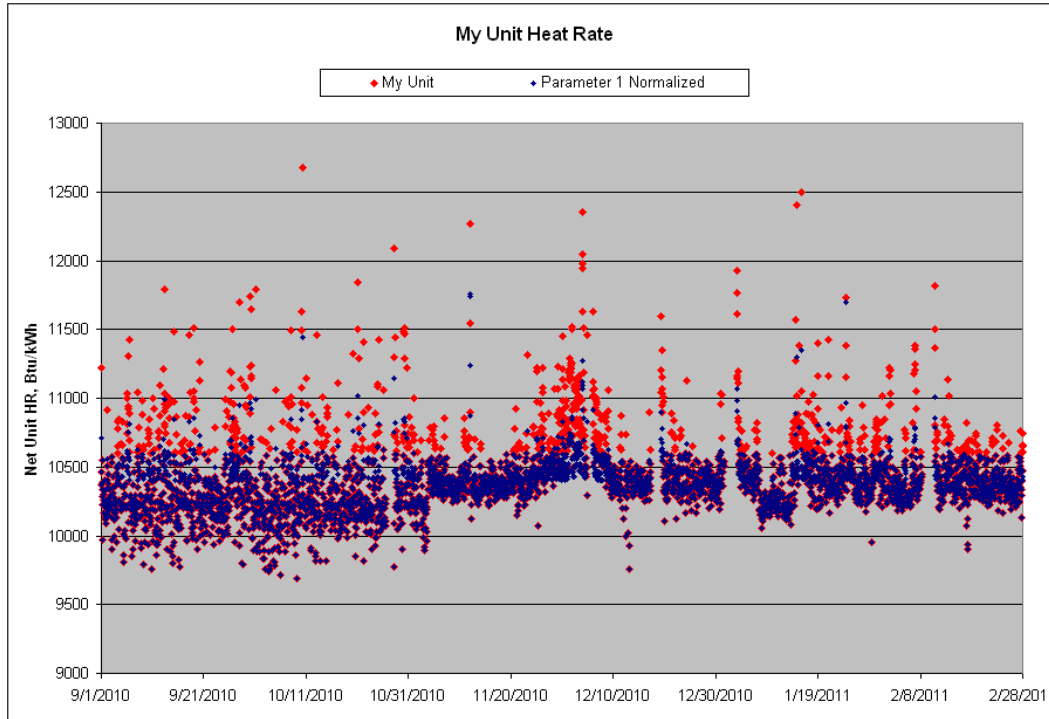


Is my unit heat rate really about average compared to the population?

Why does my unit heat rate vary so much?

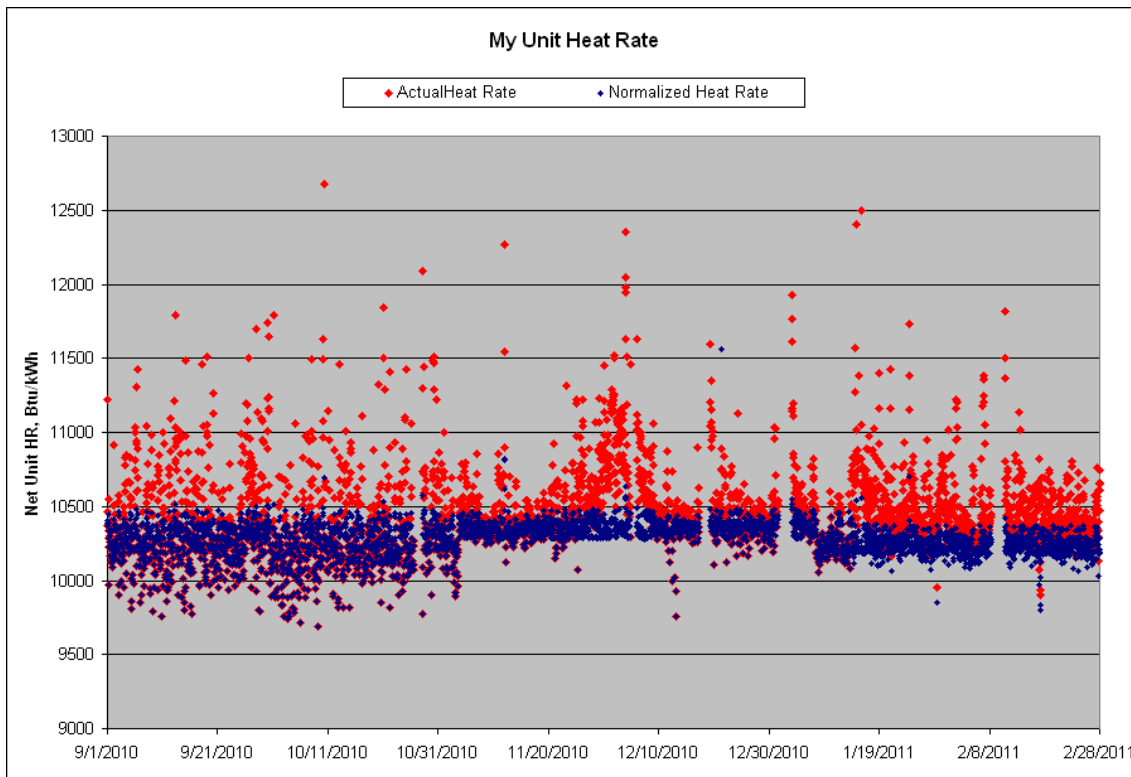
- Uncertainty exists around the validity of the comparison
- Mixed calculation methods cloud the results
- This is not an apples-to-apples comparison

Heat Rate Normalization Process



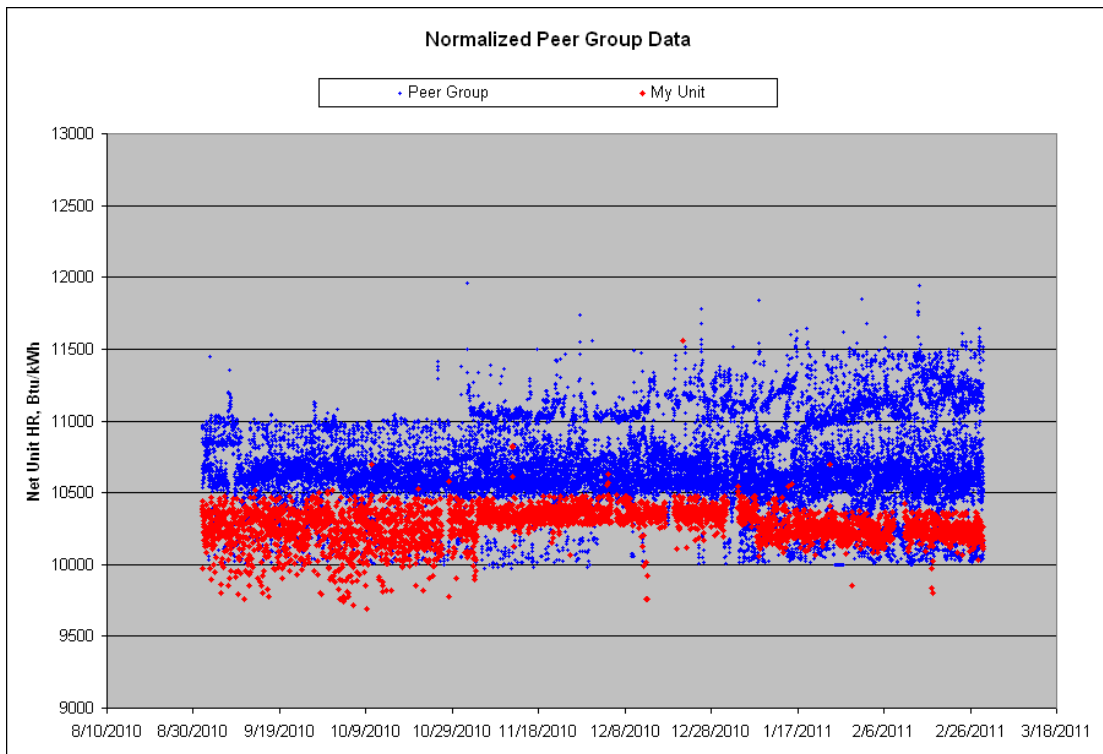
- Standard unit hierarchy
- Highly standardized performance calculations
- Normalize to account for external factors
- Minimize differences between units

Actual and Normalized Heat Rate



- Actual heat rate:
 - Subject to external forces
 - Highly variable
 - Variation hard to explain
- Normalized heat rate:
 - Reduces variability from external factors
 - Reduce data scatter
 - Supports variance analysis

Normalized Comparison



- Peer group identified
- Heat Rate data normalized
- Unit performance is better than peer group average.

Benefits

- Increased transparency allows:
 - Early identification of drift in performance and ability to factor “role” of independent/external variables (fuel, load, etc.) in/out of analysis
 - Means to understand collective response and associated impacts on performance KPI’s due to increased renewable penetration, and shifting economics of coal assets vs. gas
- Further enhances proven ROI from proactive monitoring processes & tools
- Benchmarking has a proven track record in improving availability by helping identify best performers, performance gaps (both managed and intrinsic to technology/location, etc.)
 - NERC GADs, and other international data systems
 - Other specialized benchmarking processes
- Helps sponsor and validates environmental prudence

Intangible Benefits

- Efficiency improvements yield positive impacts on overall cost and resource requirements
- Helps position existing units to better mitigate both CO₂ and cost risks via a pro-active approach to monitoring and analyzing performance.

Future Plans and Next Steps

- Implement program under collaboration with OSISoft and with early adopters
- Refine/enhance calculations and comparative analytics
- Expand participant pool across technologies and geographies
- Sponsor “near” real-time performance comparisons across both centralized and decentralized power assets.

Questions

- David Brill – brilldj@bv.com – 913-458-2232
- Scott Stallard – stallardgs@bv.com – 913-458-9764





Thank you

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