

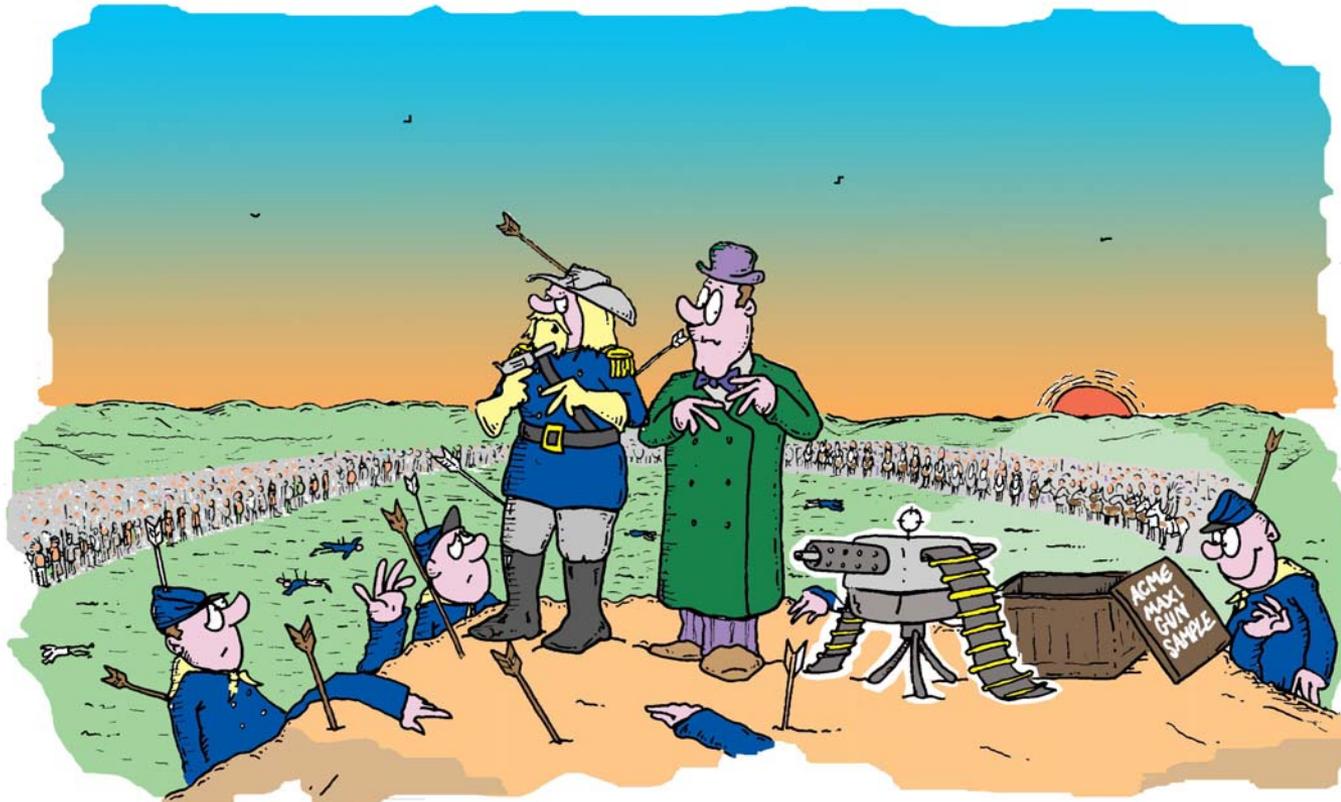


2009 Symposium Conference

January 13-16, 2009

Optimizing for the Lowest Cost Electrical Production **Using Advanced Monitoring Solutions**

Tough Times Call for Technology Solutions



"Can't you see I'm busy?"

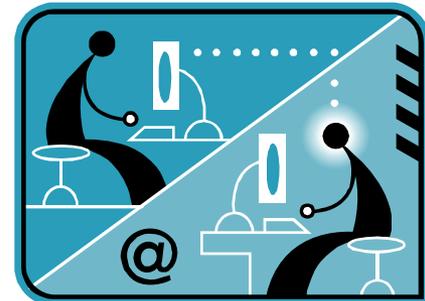


A Business Case for Technology

- Effective use of technology is critical for the success of competitive electric power generation.
- This Presentation will bring together some thermal performance business drivers that the market demands and the advanced technologies that will satisfy those needs.
- This interchange is critical to the success, and maybe survival, of each of our companies.

Thermal Performance Technology Solutions

- **Off-Line 1st Principle thermal analysis modeling applications**
- **On-Line 1st Principle thermal performance monitoring applications**
- **Advanced Pattern Recognition applications for Equipment Reliability**
- **Integrated Condition Monitoring applications**



Heat Rate Improvement – A Business Case Defined

Power Plant Competitive Issues

- **The Tall Poles under the Tent”**: environmental, fuel costs, capacity factor and capital investments
- **Current conditions favor low-cost producers with strong balance sheets**
- **The Fuel Cost Pole: Heat Rate (HR) is a major driver of fuel costs**





The Fuel Cost Pole

- **HR improvement program is more than routine engineering calculations.**
- **Profitable utilities must have a mandatory HR strategy for sustainable profits and survival, i.e., executive sponsorship.**
- **Fuel costs: ~ 250% increase in last year's coal prices.**
- **Fuel represents 77- 93% of electrical production costs (depending on fuel type and transportation costs).**
- **HR awareness and optimization is critical to competitive operations.**
- **Being available isn't good enough any longer!**



Heat Rate Improvement Program – Establishing the Business Case

- **HR Program: Attitudes and empowerment with pragmatic procedures**
 - Executive sponsorship
 - Continuous HR improvement program
 - Engineering, operations & maintenance
 - Technology focused at HR improvement

- **Engineering analysis: PEPSE Off-Line HR assessments (establishing “as-is” and “to-be”)**

- **Situation appraisal: Establishing the current baseline (“as-is”)**
 - 1st principles modeling: thermal kit & acceptance tests
 - Thermal kit: design basis plus changes
 - Acceptance tests: “as-is” condition
 - Tuning to recent HR tests

- **Establishing the most accurate, best achievable (“to-be”) condition**



Heat Rate Improvement Program – Establishing the Business Case (Cont'd)

➤ **Developing a HR improvement program with a business case: i.e., the “Gap” (“as-is” vs. “to-be)**

- **Establishing credible HR improvement work processes**
- **On-Line monitoring to “best achievable” goals**
- **Cost-effective capital investment projects (options)**

➤ **PMAX On-Line monitoring characteristics**

- **Comprehensive, on-line HR monitoring application, validated over 25 years of use for heat rate improvement**
- **Diagnostics for operations and maintenance**
- **Data validation for results integrity**
- **Web-based User Interface**
- **Utilize PEPSE’s link for the most accurate, best achievable set points for HR and performance monitoring**



Transforming plant data into business value - "It's all about the model."

➤ **PEPSE technology and modeling: Off-Line thermal performance analysis**

- 1st Principles modeling for design or test modes
- Detail, thermal-hydraulic component modules (100s of modules)
- "What-If" studies: Predictive evaluation of plant modifications, operation changes, and variance analysis
- Automated test data reduction
- Module validation in over 30 years of use by utilities, A/E's and consulting engineers documented with published technical papers
- Drag and drop modeling features
- Comprehensive thermal-cycle process capability (fossil and nuclear steam, gas turbine, combined cycle, cogeneration, alternate energy)
- Utilizes recognized professional standards



Establishing the most accurate, best achievable condition and set points

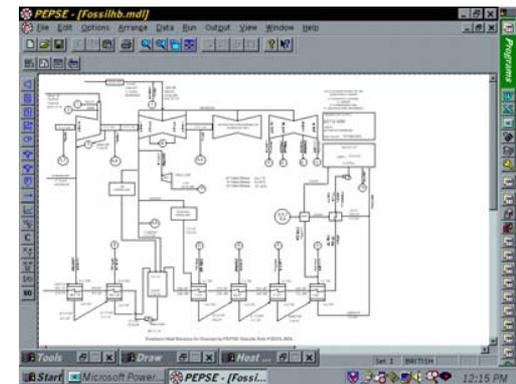
➤ **Engineering services to analyze HR performance: Use Domain knowledge of Subject Matter Experts**

- **Perform off-line plant degradation studies and detailed analysis of boilers and turbine cycles, i.e., HR evaluation of complete thermal process cycle**
- **Establishing realistic HR Curves, e.g., HR Kit Changes**
- **Tune model to acceptance test data or other suitable operational data**
- **Dynamic power level performance calculations**
- **Evaluation of new or modified plant components**
- **Incremental heat rate reduction studies**

Establishing the most accurate, best achievable condition and set points (Cont'd)

➤ **PEPSE is a proven, off-line, thermal performance analysis application**

- Analyze power cycle process efficiencies
- Determines best achievable set points for on-line monitoring
- Case histories: Numerous case histories documenting success of PEPSE in modeling and solving HR issues
- See: <http://pepse.scientech.us/papers.html>
- Used by all major AE firms for HR analysis



The Business Case Results

Financial payback achieved with the PEPSE application using most accurate set points

- **On a 500 MW unit, 1% heat rate improvement \geq \$1.5M/yr in fuel savings**
- **Examples of heat rate improvements**
 - Reduced sprays: 0.5 - 2%
 - Condenser cleanliness: 1 - 2%
 - Feedwater level control: 0.5 - 1%
 - Boiler exit gas temperature (sootblowing): 0.5 - 3%
 - Aux steam extraction usage: 1 - 5%
 - Turbine outage tracking: 1 - 5%





Before

&

After



Technology may have changed history





Conclusions

- **There is a business case for implementing advanced technology to improve HR and reduce operating and maintenance costs.**
 - Requires a formal HR program with executive sponsorship.
 - Requires a mature, detailed, 1st Principles, off-line modeling/analysis application in conjunction with an advanced on-line monitoring application.
 - Requires engineering expertise to analyze existing component and system boundary conditions thus allowing definition of key performance parameters and process set-point optimization for monitoring and control.
 - Requires daily monitoring and diagnostics.
 - Payback may be within 6-12 months in the implementation of these advanced technologies.



Conclusions (Cont'd)

- **There has never been a better time for implementing advanced technology.**
 - **Less frenetic times to accelerate technology innovation.**
 - **Empower People: Allows staff to learn, test and move up the learning curve.**
 - **Implementing new systems requires an investment of personnel resources and capital to realize an ROI.**
 - **Select the right innovation partners to achieve competitive objectives.**



Our Commitment

- **Sciencetech will partner in your technology and personnel investments to provide: a profound value for your business success during these times of economic downturn.**
 - FAMOS Suite of Solutions
 - > 25 years of power plant performance services
- **Now is the time to rethink performance HR improvement technology strategies.**



Questions & Answers

