

#### The Seven Traits of Highly Effective Performance Programs

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## **Trait 1: Business Case**

What's My Motivation to Improve Performance?

- Efficiency alone may not sell
- Expand the definition of "Performance" to include:
  - Capacity
  - Emissions
  - Equipment reliability
  - Maintenance scheduling
  - Fuel flexibility
  - Others?

Without a business case support and funding is unlikely

### **Trait 2: Management Support**

**Do I have Personnel and a Budget?** 

- Need a high-level management sponsor
- Need support of all levels at the plant
- What is the personnel budget for performance?
- Is there a budget (capital / O&M) for performance?
- Continuous and visible management interest in performance goes a long way!

#### **Trait 3: A Goal**

"Begin with the end in mind."

#### A: Figure out where you are

- Plant Assessment
- Performance Benchmark
- Performance Target
- B: Decide where you are going
  - Define a realistic end goal or target

Until you have A and B, you don't know which direction to go

# Trait 4: A Plan

#### "Be Proactive"

- Focus on cost effective efforts
- Define milestones on the way to the goal
- Milestones provide useful means to measure progress
- High return programs
  - Cycle Isolation Program
  - Condenser Performance Monitoring
  - Controllable Losses Monitoring
  - Boiler Optimization
- Periodic Testing Program
- Others

# A 10-Step Program to Improve Your Life Through Isolation

- 1. Identify the key "high to low energy" leakage paths
- 2. Review FWH heater isolation (edrains, bypass, startup vents and vent bypass)
- 3. Check steam traps for proper operation, and assure bypasses are closed.
- 4. Assure auxiliary steam is supplied from the lower energy source.
- 5. Make sure boiler feed pump recirculation valves close at higher loads.

- 6. Develop a plant specific list of these key valves. The list will usually include 20 to 30.
- 7. Use the isolation list immediately after startup.
- 8. Use the isolation list weekly to verify changes.
- 9. An IR temp gun can be used to check for leakage.
- 10. If a valve is leaking, first assure it is closed. Close manual block valves if it can be done without risk to the plant. Get the leaking valve on the maintenance list. Prioritize by highest to lowest energy loss.

# **Condenser Performance Monitoring**

Is condenser pressure where it should be?

- Compare condenser pressure to target as a function of load and circ water inlet temp
  - Measured = Target → Cond Probably OK, check CW source
  - Measured < Target  $\rightarrow$  Problem with target or measurement
  - Measured > Target → Underperforming
- Heat load
  - If you are monitoring cycle isolation, you should have a good handle on this already
- Air in-leakage
- Cooling water flow
- Tube fouling



# Heat Rate and Capacity Sensitivity

#### **Controllable Losses**

Parameter	Deviation from Target	Generation Impact (MW)	Heat Rate Impact (Btu/kWh)	Fuel Cost Impact (\$/yr)
Main Steam Temp	-10°F	0.2	18	\$90
Hot Reheat Temp	-10°F	-2.4	12	\$60k
Final FW Temp	-5°F	2.2	11	\$55k
Main Steam Press	-10 psi	-2.1	2.5	\$12.5k
Condenser Press	+0.1InHga	-0.5	10	\$50k
Econ O2	+ 0.5% point	-	16	\$80k
AH Exit Temp	+10°F	-	30	\$150k
Others				

## **Boiler Optimization**

Key areas to review for boiler losses

- Air heater / Exit gas temperature
- Sootblowing / Spray flow
- Economizer O<sub>2</sub>
- Combustibles in refuse

#### **Periodic Testing Program**

**Repeatable testing using station instruments** 

- Adds to ability to diagnose process changes
- Helps in maintenance planning and scheduling
- Provides an excuse for detailed cycle review
- Helps detect anomalies that are masked by normal operational changes

## **Daily Review**

- Review controllable losses
  - Condenser pressure
  - Exit gas temp
  - Final FW temp
  - Auxiliary power
- Review major component efficiency, if available
  - HP / IP / LP efficiency
  - Boiler efficiency
- Review heat rate vs. capacity if available
- Cycle isolation

## **Traits 5: I&C Component**

- Critical Measurements
- Controls / Controls Tuning
- Instrument Calibration / Maintenance Program
  - Documentation of as-found / as-left
  - Improvements in instrument quality make this more important
  - Calibration equipment must be maintained
  - Temperature calibrations often mis-understood

## **Critical Measurements**

#### **Primary Instruments**

- Pressures
  - Main Steam
  - Condenser
- Temperatures
  - Main Steam, HRH Steam
  - Final Feedwater
- Flows
  - Feedwater
  - SH and RH spray
- Economizer O<sub>2</sub>
- Air Heater Exit Gas
- Power Gross, Aux, Net

#### **Secondary Instruments**

#### Pressures

- 1<sup>st</sup> Stage Steam
- Cold Reheat Steam
- Hot Reheat Steam
- Crossover Steam
- Temperatures
  - Cold Reheat Steam
  - Crossover Steam

# **Controls / Controls Tuning**

- Just because the DCS says it doesn't mean it's right!
- Well tuned controls can maintain controllable parameters at optimum levels

#### Main Steam Pressure





#### **Trait 6: Communications**

"Seek first to understand (then be understood)"

- Highlight key performance drivers to staff
- Good relationship between performance and operations
- Ops has constant eyes on the plant
- Maintenance activities impact performance
- Close the loop on investigated issues
- Make periodic summary reports available
- Communicate in cost!

## **Trait 7: Team Approach**

"Synergize"

- Leverage existing plant resources and knowledge
- Share best practices
- Everybody in the plant can have an impact on performance
- Spreads performance duties
- Improves communications and information sharing
- Demonstrates management support
- Integrates performance into the work culture

# **Trait 8: Training**

"Sharpen the Saw"

- Top down and bottom up
  - Management
  - Engineering / Technical
  - Operations
- Everyone needs to speak the same language!
- Make sure you walk the walk!

#### **Trait 9: Tools**

- Clipboard, calculator, brain
- Heat balance modeling
- Data Tools
  - archival and retrieval
  - validation
  - trending and comparison
- Performance monitoring
- Condition monitoring
- Alerting
- Reporting

## **Trait 10: Evolve**

- **Or Become Extinct**
- Evaluate activities frequently
- Quantify results \$\$\$\$
- - Fix it
  - Ditch it

Keep watching the industry and evaluate new technology

# The Seven Traits of Highly Effective Performance Programs

Oth Trait: Learn to Count

- 1. Business Case
- 2. Management Support
- 3. A Goal
- 4. A Plan
  - 1. Cycle Isolation Program
  - 2. Condenser Performance Monitoring
  - 3. Controllable Losses Monitoring
  - 4. Boiler Optimization
  - 5. Periodic Testing
  - 6. Others

- 5. I&C Component
- 6. Communications
- 7. Team Approach
- 8. Training
- 9. Tools
- 10. Evolution

Consider these "seven" traits to help you reach the pinnacle of performance!