Plant Optimization & Performance Software
Environmental Management
- NOx / SO2 cap compliance
- NOx / CO / CO₂ minimization
- Opacity Reductions

Unit Performance
- Heat Rate Improvements
- Combustion Efficiency
- LOI reductions

Generation Management
- Fleet / Economic Optimizer
- Global Performance Advisor

Operational Flexibility
- Dispatch Response
- Ramp Rate Improvements
A Comprehensive Suite of Intelligent Software Modules Designed to Improve Plant Performance

<table>
<thead>
<tr>
<th>Economic Optimizer</th>
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<td>Fleet Optimizer</td>
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<td>SCR and FGD Optimizer</td>
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<td>Precipitator Optimizer</td>
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<td>Unit Response Optimizer</td>
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<td>Global Performance Advisor</td>
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<td>Enterprise Data Server</td>
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Benefits

- Heat rate improvements 1/2% to 1 1/2%
- NOx Reductions 15% to 35%
- Opacity Reductions 15% to 30%
- Increased Capacity 1% to 2%
- 1% of MCR per minute improvement in ramp rate
- Reduced tube leaks and associated forced outages
- Improve fleet management capabilities
- Optimize plant environmental equipment such as SCRs and scrubbers
Years of experience in process control design, implementation, and field installation

With more than 200 SmartProcess installations on many different control systems, Emerson is the market leader in advanced control.
**What makes SmartProcess different?**

**TECHNOLOGY**

- Advanced control and optimization solutions incorporate **fuzzy logic**, **neural networks**, **model predictive control**, and **optimization engines** designed specifically for the power industry needs.

- **Browser-based user interfaces**

- **Closed loop integration** — Integrates directly with any DCS or can be deployed via other protocols like OPC or OSISoft PI.

- **Automated testing** tools for quick, efficient implementation.
What makes SmartProcess different?

**FLEXIBILITY**

- DCS platform independent
- Versatility to optimize for *multiple objectives* under *varying conditions*
- **Dynamic** routines that steady-state approaches cannot match – Optimizer runs every 10 to 20 seconds, outperforming all other comparable products
- **Adapts** and **learns** changing plant conditions
What makes *SmartProcess* different?

**ADAPTABILITY**

- No daily maintenance – *SmartProcess* self adapts to the subtle long term changes in the plant dynamics
- Data validation tools and comprehensive support capabilities available
- Easily upgraded with base plant control system upgrades/migrations
Deployment

- Platform independence allows SmartProcess to be implemented on Ovation, WDPF or any other distributed control system
- Integration by Emerson Process Management personnel
  - Each team includes a boiler/combustion expert, a DCS field engineer to perform DCS changes, and a neural network/optimization expert for model building and on-line tuning
- Implementation includes an initial site analysis, and can be completed in less than 3 months
- Non-intrusive implementation (i.e. no outage required, can be easily turned on or off)
- Low maintenance costs - 1 year 100% support
  - No runtime fees
  - No maintenance fees
**SmartProcess**
**Combustion Optimizer**
- Improves heat rate
- Reduces emissions
- Controls opacity levels

**SmartProcess**
**Cyclone Boiler Optimizer**
- Improves NOx levels
- Optimizes boiler combustion processes
- Improves steam temperature

**SmartProcess**
**Fluidized Bed Optimizer**
- Achieves stable boiler operation
- Reduces emissions
- Tracks performance variances
- Achieves ideal SO₂ absorption rate

**SmartProcess**
**FGD Optimizer**
- Prevents limestone binding
- Achieves better SO₂ removal

**SmartProcess**
**Precipitator Optimizer**
- Optimizes cleaning sequences
- Minimizes particle emissions

**SmartProcess**
**SCR Optimizer**
- Lowers operating costs
- Maintains optimum temperature and pressure

**SmartProcess**
**Unit Response Optimizer**
- Improves unit stability
- Increases ramp rates
- Increases startup efficiency

**SmartProcess**
**Economic Optimizer**
- Optimizes heat rate across multiple units
- Optimizes varying cogeneration electricity and steam demands
- Reduces maintenance costs

**SmartProcess**
**Steam Temperature Optimizer**
- Improves ramp rates
- Minimizes temperature variations

**SmartProcess**
**Sootblower Optimizer**
- Delivers optimal cleanliness
- Balances blowing sequences

**SmartProcess**
**Global Performance Advisor**
- Tracks heat rate deviations and cost of deviations
- Reduces operating costs

**SmartProcess**
**Fleet Optimizer**
- Provides regional optimization of multiple units for emissions, heat rate, and revenue
- Provides browser-based visualization of fleet performance
Typical SmartProcess Architecture

SmartProcess Global Performance Advisor

Operator Workstation

SmartProcess Combustion Optimizer

Engineer Workstation

Fast Ethernet Network

DCS Controller

Typical SmartProcess Integration

Plant LAN
The Economic Optimizer enhances energy allocation and plant operation, based on a number of factors, including operating costs, equipment efficiencies, and operating schedules.

**Applications**
- Fleet wide economic analysis
- Reduces operating costs on multiple equipment type plant configurations
- CHP, Combined cycle plants, Co-generation facilities
- Pumping networks
- Fuel blending strategies
- Cooling tower optimization

*Unify islands of optimization with an overall plant model*
**Fleet Optimizer**

The Fleet Optimizer manages environmental compliance on a fleet-wide scale with portal technology.

*Results*

- Replicates and/or diversifies calculations used for business decisions
- Provides reporting for O&M costs and real time heat rate
- Predicts emission cap compliance based on load forecasts
- Actively optimizes plant settings to achieve desired compliance target margins
- Provides data redundancy of key variables

*Operate cost-effectively while achieving SO2 or NOx compliance.*
Optimizing Fleet-Wide Control

The Fleet Emissions Optimizer uses data from multiple areas of the plant for fleet to achieve industry objectives.

- Environmental Compliance
- Decreased Operations Costs
- Increased Profitability

SmartProcess
Standalone Server
The Fleet Emissions Optimizer collects data from segregated areas throughout the fleet... 

- Operating Labor Costs
- Heat Rate Penalties
- Maintenance Costs
- Current Emissions Rate
- Emissions Cap Compliance
- Changing Plant Conditions

... and tracks fleet performance over time to create an efficiency curve that adjusts with daily operations and plans for future scenarios.
Fleet Emissions Optimization Objectives

- Determine optimum SO$_2$ emission rate for FGD systems so that the total amount of SO$_2$ produced does not exceed the yearly cap.
- Report and control for removal efficiency $>70\%$.
- Optimize for the most cost effective flue gas scrubbing.
Fleet Optimizer Architecture

- Enterprise Data Server
- Client Terminals
- Enterprise Data Server
- Connect
- Enterprise Data Server
- DCS or DAS
**deadband values for each quarter of year**

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Actual MERP system removal: 76.40
Daily MERP system removal: 88.37

**MERP**

- Total Predicted S02: 5832.8 tons
- Predicted S02 for reminder of Year: 4098.3 tons
- Actual S02 Produced in Year to Date: 1734.3 tons

You are logged as: ess2
## MERP Costs Estimates for Emission Control

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Fleet Emissions Optimizer Summary

- Resides on a central server(s)
  - Can be clustered
- Collects disparate data from various parts of the plant or fleet
- Analyzes the data to determine the best ranges of operation to balance fiscal goals with environmental requirements
- Manages air emissions and environmental costs at the fleet level
**Combustion Optimizer**

The Combustion Optimizer reduces NOx emissions, boiler efficiency while improving boiler efficiency, and maintaining loss on ignition.

*Increase the efficiency of your boiler combustion process.*

- Results
  - Reduces NOx and CO emission levels
  - Improves heat rate up to 1.5%
  - Reduces plant maintenance costs
  - Maximizes staged combustion efficiency
  - Controls and reduces measured opacity levels
# Web based interface

## Setpoints (optimization goals and constraints)

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Sensitivity Analysis User interface
Case Study
Plant Optimization – Midwest Utility Unit #2

- 20.1% Average NOx Improvements
- 1% HR Improvements at high loads
- Issues driving the need for change
  - 2003 emissions mandate to maintain NOx below 0.13#/mmBTU
  - Avoid installing SCR
  - Sell/Trade NOx credits
- 4 month project cycle
- No outage required
- Payback of 9 months on NOx improvements
  8 months on (>$400K) from Heat rate improvement

Company: AEG
Site: Newton Station

Unit: Unit #2
Location: Newton, IL, USA
MW: 615
Boiler: Alstom (CE)
Turbine: GE
Primary Fuel: Coal
Application: NOx Optimization
Steam Temp Optimization
Midwest Utility Unit #2 NOx Optimization
Results Overview – NOx Mode (100%)

- **NOx Reduction**
- **Maintain Heat rate**
- **Below Average CO Levels**
Midwest Utility Unit #2 NOx Optimization Results Overview – HR Mode (100%)

Net Unit Heat Rate

- **Heat Rate [BTU/kWh]**
  - IVY ON
  - IVY OFF

- **Unit load [MW]**
  - 250
  - 450
  - 600

- **Net Unit Heat Rate improvement**
  - Average of 1% improvement in Heat Rate over the typical Load range of 450 to 600 MW equals $407,000

Ave. of 1% improvement in Heat Rate over the typical Load range of 450 to 600 MW equals $407,000
Case Study #44
Plant Optimization – Dynegy Hennepin #2

- 13% Average NOx Improvements
- Issues driving the need for change
  - Drive plant average below .13 #/mmBTU
  - Prior solution ineffective
- Real-time optimization of NOx emissions and heat rate optimization
- 4 month project cycle
- No outage required
- Head to head comparison against “other “competitive solution
Recent BCO results for NOX

Commissioning tests NOx results

NOx trend during commissioning tests

Commissioning tests NOx reduction
**Summary**

Normal plant operation NOx reduction

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**SmartEngine ON**
- Load > 190MW
- January 25th, 2004 to March 3rd, 2004
- NOx: 0.112

**Baseline - SmartEngine OFF**
- Load > 190MW
- June 1st, 2003 to August 16th, 2003
- NOx: 0.141

Change in %
- NOx: -21.17%
Steam Temperature Optimizer

The Steam Temperature Optimizer provides precise responses to disturbances for accurate temperature control.

- Improves ramp rates up to 1% of MCR per minute
- Minimizes temperature variations by up to 75%
- Controls spray valves, tilts, pass dampers, for accurate temperature
- Multivariable control strategy to maintain optimum steam temperature

Improve steam temperature for faster ramp rates.
**Results!!**

**Auto**
- 25 MW ramp
  -35 To +25

**STO Auto**
- 90 MW ramp
  -6 To +9
The Sootblower Optimizer uses an intelligent modeling tool to develop heat rate absorption models that accurately reflect the numerous interrelationships of various heat transfer sections.

Ensure efficient sootblowing.

- Results
  - Delivers optimal cleanliness, resulting in a 0.5% heat rate improvement
  - Decreases soot accumulation
  - Improves overall boiler efficiency
  - Balances blowing sequences
  - Minimizes unnecessary steam usage
  - Reduces opacity spikes
  - Reduces NOx formations
  - Enhances steam temperature variability
Sootblower Control Illustration

Scheduler
Master
Sequencer
Blower
SmartEngine Sootblower

BOILER SECTION | DESIRED CLEANLINESS | ACTUAL CLEANLINESS | DIFFERENCE | PRIORITIES | EDIT
--- | --- | --- | --- | --- | ---
Water Wall | 0.97 | 1.008 | 0.038 | | |
Secondary Superheater | 0.99 | -0 | -0.99 | | |
Intermediate Superheater | 1.02 | 1.08 | 0.06 | | |
Finished Superheater | 1 | 0.872 | -0.128 | | |
Reheater | 1.02 | 0.875 | -0.145 | | |
Primary Superheater | 1 | 1.113 | 0.113 | | |
Economizer | 0.95 | 0.81 | -0.14 | | |
Air Heater | 0.95 | 0.964 | 0.014 | | |

Threshold: 0.1
Selection: manual

RECOMMENDED SEQUENCES:

ACTUAL SEQUENCES:

Jul 9 2003 04:11:47 PM : Cleanliness Algorithm: Secondary Superheater is fouled. However no appropriate sequence can be choosen. Reheater is fouled. However no appropriate sequence can be choosen. Finished Superheater is fouled. However no appropriate sequence can be choosen.
Jul 9 2003 04:11:47 PM : Steam Temp. Algorithm: Load is high, reheater steam temp. is high. No action is recommended.
Jul 9 2003 04:11:47 PM : Time Algorithm: No sequence has exceeded its maximum off-time. No action is recommended.
Jul 9 2003 04:11:47 PM : Running sequences: Seq01, Seq02, Seq03, Seq04, Seq05, Seq06, Seq07, Seq08, Seq09, Seq10, Seq11, Seq12, Seq13, Seq14, Seq15, Seq16, Seq17, Seq18.
Jul 9 2003 04:11:47 PM : Recommended sequences: no sequence is recommended.
Jul 9 2003 04:11:24 PM : Cleanliness Algorithm: Secondary Superheater is fouled. However no appropriate sequence can be choosen. Reheater is fouled. However no appropriate sequence can be choosen. Economizer is fouled. However no appropriate sequence can be choosen. Finished Superheater is fouled. However no appropriate sequence can be choosen.
Jul 9 2003 04:11:24 PM : Steam Temp. Algorithm: Load is high, reheater steam temp. is high. No action is recommended.
Jul 9 2003 04:11:24 PM : Time Algorithm: No sequence has exceeded its maximum off-time. No action is recommended.
Jul 9 2003 04:11:24 PM : Running sequences: Seq01, Seq02, Seq03, Seq04, Seq05, Seq06, Seq07, Seq08, Seq09, Seq10, Seq11, Seq12, Seq13, Seq14, Seq15, Seq16, Seq17, Seq18.
Jul 9 2003 04:11:24 PM : Recommended sequences: no sequence is recommended.
Jul 9 2003 04:10:49 PM : Cleanliness Algorithm: Secondary Superheater is fouled. However no appropriate sequence can be choosen. Reheater is
Soot blower signature analysis

Baseline Window

Information

SootBlower ID: K01
Cycle ID:

<table>
<thead>
<tr>
<th>Cycle</th>
<th>Date/Time (seconds)</th>
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<tr>
<td>Baseline</td>
<td>03/30/2004</td>
</tr>
<tr>
<td>Recent1</td>
<td>03/30/2004</td>
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<td>Recent2</td>
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<td>03/30/2004</td>
</tr>
<tr>
<td>Recent4</td>
<td>03/30/2004</td>
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</table>

Metrics

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<tr>
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<th>Baseline</th>
<th>High Limit</th>
<th>Low Limit</th>
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<tr>
<td>Current_Average_BlowIn</td>
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<td>1.000</td>
<td>0.950</td>
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<tr>
<td>Current_DEV_BlowIn</td>
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<td>0.100</td>
<td>-0.100</td>
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<tr>
<td>Current_STD_BlowIn</td>
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<td>0.020</td>
<td>0.000</td>
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<td>Current_COR_BlowIn</td>
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<tr>
<td>Current_Trend_BlowIn</td>
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<td>-0.001</td>
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<td>Current_Average_BlowOut</td>
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<td>Current_STD_BlowOut</td>
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<td>Current_COR_BlowOut</td>
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<td>0.100</td>
<td>-0.100</td>
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<tr>
<td>Current_Trend_BlowOut</td>
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<td>0.001</td>
<td>-0.001</td>
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<tr>
<td>Current_Peak</td>
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<td>3.000</td>
<td>0.000</td>
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<td>Current_Duration</td>
<td>200.000</td>
<td>410.000</td>
<td>300.000</td>
</tr>
</tbody>
</table>

Raw Data for the Baseline Cycle

Current (amps) | Pressure (psig) | Flowrate (kph)

Graph with data points.

Color

- Chart Color
- Line Color
- Fill Color

Options:

- Calculate
- Print Graphics
- Save
- Cancel

Baseline

EMERSON Process Management
Status tool and Reports
Case Study: Sootblower Optimization
Southern California Edison - Mohave Unit #1

- Heat transfer rate increases
  - 8-10% water wall and div superheaters
  - 6-7% final superheater and front reheat
  - 2-4% rear reheat and economizer

- Opacity reduction
- Issues driving the need for change:
  - Reduced opacity spikes during sootblowing and load ramps
- Real-time sootblower optimization
- 5 month project cycle
- No outage required
- Estimated payback of 8 months
Result: Stack opacity

Opacity-Megawatt Ratio

- Gas Co-firing
- Normal Operational Procedures

Legend:
- July
- August
- Sep1~13
- Sep14~26
Global Performance Advisor

The Global Performance Advisor allows operators to identify controllable losses, track equipment performance against design specifications, and quickly identify problematic process areas to reduce operating costs.

Monitor and benchmark plant performance.

Results

- Reduces operating costs by tracking unit heat rate penalty costs over time and indicating dollars lost due to equipment performance deviations.
- Calculates net unit heat rate and tracks heat rate deviations.
- Displays deviations and cost of deviations to help operators determine corrective action or flag equipment repair and maintenance needs.

EMERSON
Process Management
- Unit Heat Rate Module
- Turbine Heat Rate Module
- Turbogenerator Heat Balance
- Condenser Performance Module
- Boiler Performance Module
- Economizer Performance Module
- Boiler Feedwater Feedheater Train
- Boiler Feedpump Turbine Module
- Fan Efficiency Module
- Large Pump Performance Module
- Cooling Tower Module
### Gross Turbine Cycle Heat Rate

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual</td>
<td>BTU/KWH</td>
<td>???????Q</td>
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<tr>
<td>Design</td>
<td>BTU/KWH</td>
<td>???????Q</td>
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<tr>
<td>Deviation</td>
<td>BTU/KWH</td>
<td>???????Q</td>
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<tr>
<td>Corrected</td>
<td>BTU/KWH</td>
<td>???????Q</td>
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### Generator Output

<table>
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<tr>
<th>Parameters</th>
<th>Unit</th>
<th>Value</th>
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<tbody>
<tr>
<td>Gross Output</td>
<td>MW</td>
<td>???????Q</td>
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<tr>
<td>Total Correction</td>
<td>MW</td>
<td>???????Q</td>
</tr>
<tr>
<td>Corrected Output</td>
<td>MW</td>
<td>???????Q</td>
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</tbody>
</table>

### Detailed Heat Rate / Output Correction Data

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Unit</th>
<th>Design Value</th>
<th>Actual Value</th>
<th>Output Deviation (MW)</th>
<th>Heat Rate Dev (BTU/KWH)</th>
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</thead>
<tbody>
<tr>
<td>Throttle Steam Temp</td>
<td>DEGF</td>
<td>???????Q</td>
<td>???????Q</td>
<td>-2 -1 0 1 2</td>
<td>???????Q</td>
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<tr>
<td>Reheat Steam Temp</td>
<td>DEGF</td>
<td>???????Q</td>
<td>???????Q</td>
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<td>Throttle Steam Press</td>
<td>PSIG</td>
<td>???????Q</td>
<td>???????Q</td>
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<td>Reheat Press Drop</td>
<td>%</td>
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<td>???????Q</td>
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<td>Exhaust Press</td>
<td>IN HGA</td>
<td>???????Q</td>
<td>???????Q</td>
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<td>Reheat Spray Flow</td>
<td>KLB/HR</td>
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<td>???????Q</td>
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<td>Superheat Spray Flow</td>
<td>KLB/HR</td>
<td>???????Q</td>
<td>???????Q</td>
<td></td>
<td></td>
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<tr>
<td>BFP Turb Ext Steam</td>
<td>KLB/HR</td>
<td>???????Q</td>
<td>???????Q</td>
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<tr>
<td>Make Up Water</td>
<td>KLB/HR</td>
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<td>???????Q</td>
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<td>Condser Subcool</td>
<td>DEGF</td>
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<td>???????Q</td>
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<td>Top Heater TTD</td>
<td>DEGF</td>
<td>???????Q</td>
<td>???????Q</td>
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<tr>
<td>Other HTRS Combined TTD</td>
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<td>???????Q</td>
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<td><strong>Totals</strong></td>
<td></td>
<td>???????Q</td>
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</table>

### Additional Panels

- LDC Mode
- Megawatts
- THROT PRESS
- THROTTLE TEMP
- SH TEMP
- RH TEMP
- Cond Press
- Inst Opacity
- Excess O2
- Drum Level
Condenser Design Data Screen

### Algorithm Properties - Cnddesign

**Configuration**
- # Of Compartments: 5
- # Of passes through Condenser: 2
- Design Cleanliness Factor: 90%
- Makeup Water Units: KLB/HR

**Condenser Duty**
- Is Circulating Water Flow: No

**Compartment In-Service Status**
- Digital Flag
- Compartment Temperature Rise Threshold: 10 DEG. F

**Condenser Tubes**
- Compartment #: 1
- Material: Stainless Steel 304/316
- Number of Tubes: 5514
- Tube Wall Gage: 22 BWG
- Outside Tube Diameter: 0.8725 IN.
- Tube Length: 43.25 FEET

**Material Table**

<table>
<thead>
<tr>
<th>Material</th>
<th>C...</th>
<th>#...</th>
<th>Wall...</th>
<th>Outsi...</th>
<th>Lerr</th>
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</thead>
<tbody>
<tr>
<td>Stainless Steel 30...</td>
<td>1</td>
<td>5...</td>
<td>22</td>
<td>0.8725</td>
<td>43.25</td>
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<tr>
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<td>2</td>
<td>5...</td>
<td>22</td>
<td>0.8725</td>
<td>43.25</td>
</tr>
</tbody>
</table>

**Total Tubes**
- Compartment 1: 5514
- Compartment 2: 5514

### Options
- OK
- Cancel
- Apply
- Help
Fully, Configured Dynamic Link Library Containing Plant-Specific Performance Calculations

- Unit Heat Rate Module
- Turbine Heat Rate Module
- TG Heat Balance & Efficiency Module
- HRSG Performance Module
- Combustion Turb. Performance Module
- Condenser Performance Module
- Cooling Tower Module
- Large Pump Performance Module
### Unit Performance Overview

#### Unit Totals

<table>
<thead>
<tr>
<th>Component</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>MW</td>
</tr>
<tr>
<td>Fuel</td>
<td>KLB/HR</td>
</tr>
<tr>
<td>Process Steam</td>
<td>KLB/HR</td>
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</table>

#### Unit Performance

<table>
<thead>
<tr>
<th>Component</th>
<th>Actual</th>
<th>Design</th>
<th>Deviation</th>
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</thead>
<tbody>
<tr>
<td>Net Unit Heat Rate</td>
<td>????</td>
<td>????</td>
<td>???</td>
</tr>
</tbody>
</table>

---

**Key**

- CTG: Combustion Turbine Generator
- HP: High Pressure
- LP: Low Pressure
- HRSG: Heat Recovery Steam Generator
- AUX: Auxiliary
- BTU/KWH: British Thermal Units Per Kilowatt Hour
- GENERATOR: Generator
- EXHAUST STEAM: Exhaust Steam
- STEAM TURBINE: Steam Turbine
Typical Ovation GPA

- GPA / Operator Station
- Operator Station
- Fast Ethernet Network
- Engineer/Developer Studio
- Plant LAN
- Ovation Controllers
- Ovation I/O
- Ovation I/O
- Fast Ethernet Network

EMERSON
Process Management
The Enterprise Diagnostic Server (EDS) collects and processes plant data. It allows users to access current and historical data gathered from control systems and other plant data sources.

- Up to 100,000 process point capability
- Operates on various systems, including Linux, Windows NT, Windows 2000, Windows 95, and Sun Solaris
- All-in-one capabilities: alarms, visualization, reports, calculations, archival data storage, optimization, and advanced analysis
- Gathers data from the entire enterprise or multiple sources in one place
- Unified source of data for analysis, calculations, and process optimization
- Flexible source for visualization and reporting
EDS Structure

DCS or DAS
(EDS connect)

EDS Server

EDS Terminals
Performance Monitoring System

Data Validation and Substitution

- Developed as standalone algorithm with OPC interface
- Load data step has data analysis for bad data, unrecognized values, unknown error tags, overlapping and lack of data samples
- Neural model for key sensors such as fuel flows, feedwater flows, etc.
- Traditional approaches to secondary sensors, such as substitute values, curves, etc.
- Full scale replacement data via ULS module
<table>
<thead>
<tr>
<th>Timestamp</th>
<th>Type</th>
<th>Kind</th>
<th>Priority</th>
<th>Name</th>
<th>Description</th>
<th>Value</th>
<th>Level</th>
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<tbody>
<tr>
<td>15:13:01 07/03/2003</td>
<td>ALRM</td>
<td>IMPORTED LOW</td>
<td>4</td>
<td>D3BO5HOUTABS</td>
<td>Superheater outlet heat abs.</td>
<td>0.00</td>
<td>0.00</td>
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<tr>
<td>15:12:13 07/03/2003</td>
<td>ALRM</td>
<td>IMPORTED LOW</td>
<td>2</td>
<td>D3MWCNT</td>
<td>Megawatt</td>
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<td>6</td>
<td>D3BOPSHTABS</td>
<td>Primary superheater heat abs.</td>
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<tr>
<td>15:09:40 07/03/2003</td>
<td>ALRM</td>
<td>IMPORTED LOW</td>
<td>8</td>
<td>D3BOPLTNABS</td>
<td>Superheater platen heat abs.</td>
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<tr>
<td>15:07:16 07/03/2003</td>
<td>ALRM</td>
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<td>5</td>
<td>D3RHSWFLOW</td>
<td>Rhr spray water flow</td>
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<td>D3BOREHTABS</td>
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<td>D3WIPST</td>
<td>Steam temp.</td>
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<td>2nd stage spray water flow</td>
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<td>ULS_O2_C1</td>
<td>Component 1</td>
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<td>14:51:03 07/03/2003</td>
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<td>7</td>
<td>D3BOOPACITY</td>
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<td>3</td>
<td>D3SAW24</td>
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<td>D3AIRHTRABS</td>
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<td>ALRM</td>
<td>IMPORTED HIGH</td>
<td>1</td>
<td>A531</td>
<td>MAIN TURB OIL TNL REL HUMIDITY</td>
<td>90.0</td>
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<td>11:05:11 07/03/2003</td>
<td>ALRM</td>
<td>IMPORTED HIGH</td>
<td>1</td>
<td>A1P219</td>
<td>SEALING STEAM HEADER PRESSURE</td>
<td>6.0</td>
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<td>10:15:19 07/03/2003</td>
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<td>IMPORTED HIGH</td>
<td>1</td>
<td>A1P066</td>
<td>TURB GLAND SEAL 5TH PRESS</td>
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<td>BFP 1-1 GLAND SEAL TROUBLE</td>
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<td>2</td>
<td>MBP0023D</td>
<td>BUNKER #1 CARBON MONOXIDE</td>
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<td>IMPORTED HIGH</td>
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<td>EH SKID#1 MOTOR#1 AUTO PB TEXT</td>
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<td>RBV/8 FAIL TO OPEN</td>
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<td>4</td>
<td>DIEC06</td>
<td>BFPT 1-1 OIL CLR OUTLET TEMP</td>
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</tr>
</tbody>
</table>

Shown: 25/25
# Reporting functions

![Image of Reporting functions interface](image.png)

### POWER PLANT REPORT

**Average production**

- **Done:** 1523:13 07/09/2003
- **Period:** 00:00:00 07/09/2003
- **Innerv (s):** 0000
- **Point:** AGENMW
- **Unit:** MW

### SELECTED GENERATOR MW

<table>
<thead>
<tr>
<th>Start time</th>
<th>End time</th>
<th>Result</th>
</tr>
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Point list and help

Display of point list

Button 'Point List' on the ESS II Control Panel allows displaying a window with a list of all process points defined in the system together with their parameters. The figure below shows such a window. To view full settings of a point, the user has to select it on the list.

Area marked in blue at the upper right part of the above window allows to filter the displayed list of points with regard to security groups. Each check-box allows to include points belonging to the desired group. Area 'Group' allows doing the same, but with regard to sources of data (field ID).

Trend Window can be opened by selecting the requested point and clicking the trend button on the top.

The drag-and-drop feature allows to add a new point to an already opened Trend Window just by selecting a point on a point list and dropping it on the Trend Window.
Profile definition
Questions?