



Collaborative Manufacturing

Haldor Topsøe Using PI to Improve Diesel Hydrotreater Performance

&

Summary of Similar Initiatives by Other Companies

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Opportunities in Manufacturing

- 80% of cost directly related to finished product, so why all the emphasis on indirect cost?
- Information locked in your information systems can be released to create additional value
- People across your organization can help improve operational performance, not just those located on-site
- Many “outsiders” – suppliers, consultants & partners – can add value to your operations, but only if they can see your data



Web-Powered Manufacturing™



Any real-time plant information system

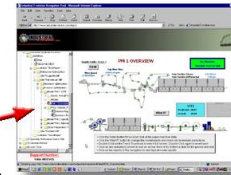
Encrypted data across a secure VPN connection



Inventory Information

Shared Inventory Management

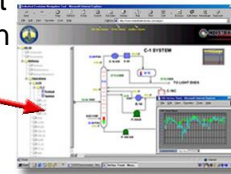
Chemical Suppliers



Process & Equipment Information

On-Line Tech Support

Process Licensors
Equipment Vendors
Chemical Suppliers



Remote Troubleshooting

Central Experts
External Consultants



Production Information

Collaboration

JV Partners
Contract Manufacturers

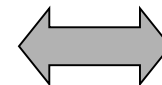


Web-Powered Manufacturing for Internal Users

- Oversee complete fleet of operations from head office
- Tie in small operations to the larger operation
- Access to plant by mobile personnel – managers, salesmen, traders, etc.
- Outsourcing strategy
 - Use Internet instead of WAN
 - Use 3rd party resource instead of your own

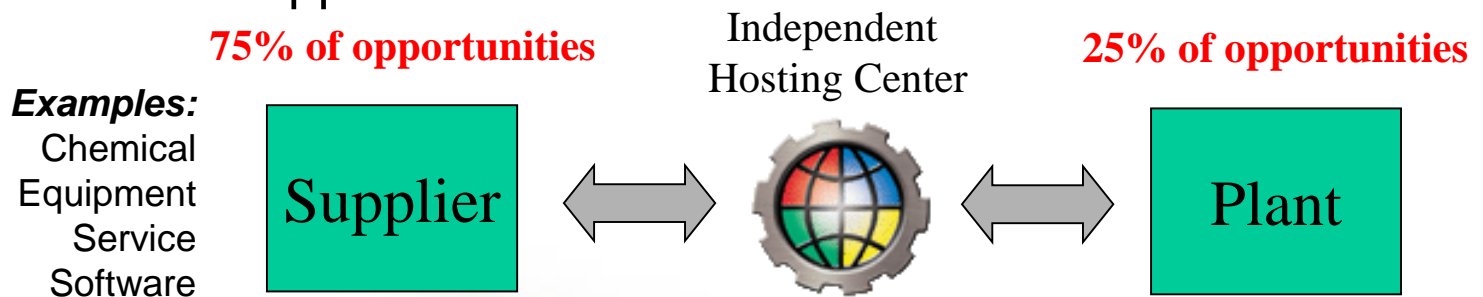
Independent
Hosting Center

25% of opportunities



Web-Powered Manufacturing for Collaborative Users

- Extend source of expertise beyond your own people
- Monitor position in a JV operated by a partner
- Manage plant located elsewhere
- Equipment supplier remotely troubleshooting his equipment on your site
- Supplier managed inventory or shared inventory management
- Chemical supplier providing remote pro-active guidance in operation of your plant
- Software suppliers taking responsibility for the results of their applications



Haldor Topsøe Launches Web-Powered Consulting

- Leading catalyst manufacturer and supplier
- Focus on oil, power, chemical, petro-chemical & fertilizer industries
- HQ in Denmark, US operations in Houston
- Provides technical support to all its customers





Current Situation

- Oil refinery buys catalyst for diesel hydrotreater
- Haldor Topsøe has expertise in hydrotreating operation and optimization
- Beneficial relationship if Haldor Topsøe can help optimize the process and the refinery continues to buy their product





Anticipated e-Collaboration

- Haldor Topsøe needs real-time access to process operation
- Oil refinery worried about security, confidentiality & accidental/malicious loading of their systems
- Oil refinery grants Haldor Topsøe access to its real-time information
- Industrial Evolution implements secure connection and builds Website
- Data synchronized and hosted in Industrial Evolution hosted PI System



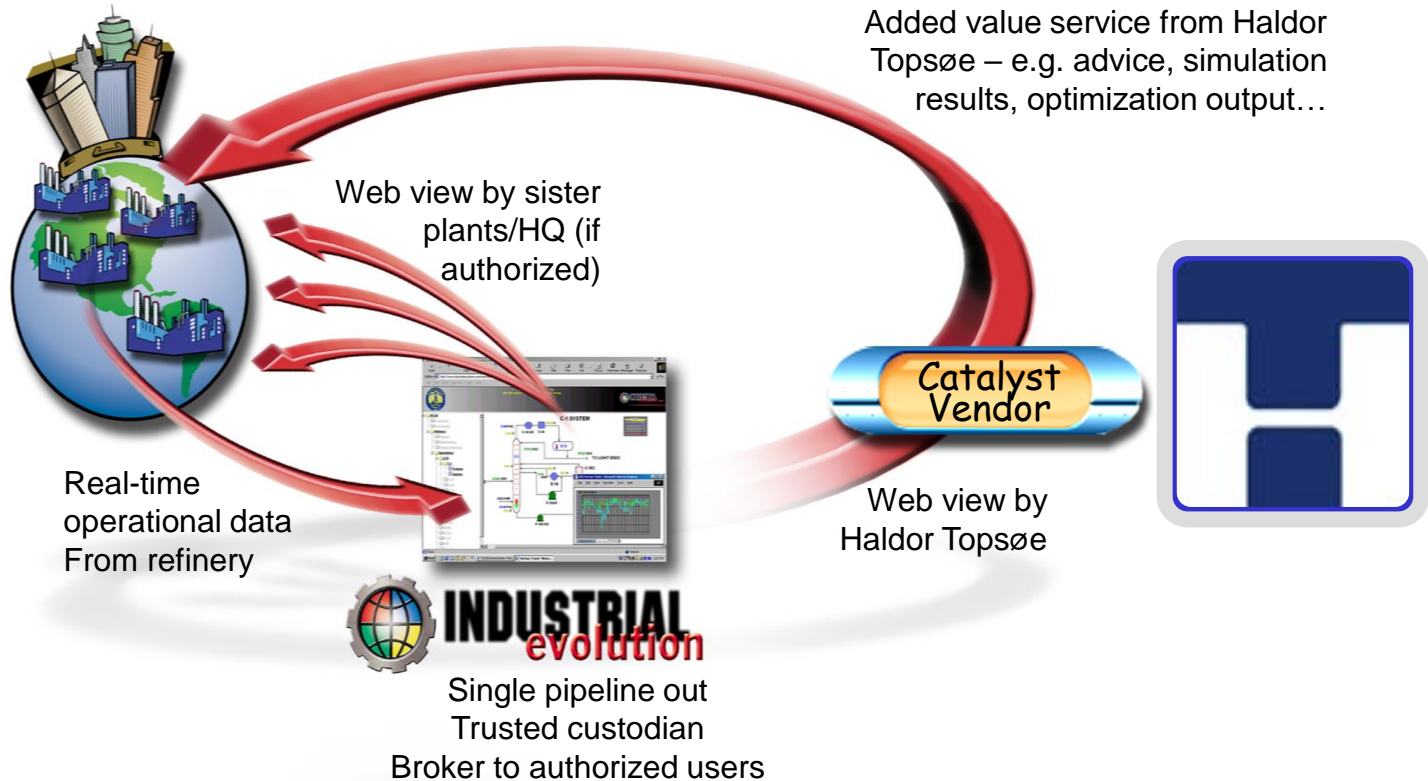


Haldor Topsøe's New Service

- Haldor Topsøe implements proprietary performance equations in hosted PI System
- Haldor Topsøe engineer accesses data via the Internet
- Haldor Topsøe contracts to improve hydrotreater operation
 - Improve reactor run-length
 - Optimize yield performance
 - Reduce working capital of holding inventories



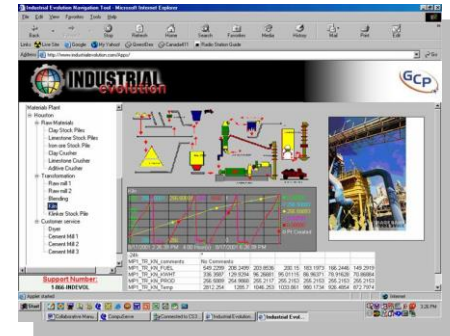
Collaborative Architecture





Data Visualization

- Uses a standard Web Browser
- Uses existing graphics, reports & displays where available
- 100% server-based
- Can view current and historical data
- Both parties can see the same data
- Very fast even over a regular telephone line due to data compression



Industrial Evolution Applications - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Refresh Search Favorites Media Print

Links Industrial Evolution Live Site Test Site OSI Software Google Ask Jeeves My Yahoo! CNN.com MapQuest

Address http://www.industrialevolution.com/apps/

INDUSTRIAL evolution Help System Requirements

3/11/2002 3:39:37 PM

C-1 SYSTEM

LEGEND
Temperatures (Yellow)
Flows (Green)
Pressures (Blue)

Crude Inventory
Product Inventory
Summary
Report 1
Report 2
Report 3
Report 4
Operations
Plant Overview
LCU
C-1
Preheat
System
C-17
C-12
C-13
C-15
HCU
LCVU
HCVU
CRU #1
CRU #2
ISOM
PT #1
PT #2
DHU
CPU #1

FEED 36.0 KBD
219.1 F
29.8 PSIG
E-16 A/B
E-46
73.5 F
2034.7 B/D
3898.1 B/D
TO LIGHT ENDS
319.7 F
157.2 F
E-14
290.4 F
9.0 KBD
C-18C
P-78
E-28
E-40
2395.8 B/D
C-1 S
693.8 #/HR
36.1 PSIG
422.7 F
P-20A/B
TO H-11
P-108 A/B

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Done Internet

Start

Sent Items - Microsoft Ou... ACT! - [SGW Contacts - E... Microsoft PowerPoint - [O... Industrial Evolution A...

3:39 PM

Example display

Problem Analysis

- Haldor Topsøe will view inventories and generate a replenishment order
- Engineers will download data for analysis by themselves or by a software application
- Key performance indices will be generated and input back into the database for long term trending improvements



Integrated Software Applications

- A software application can be integrated with the hosted database
- This enables both Haldor Topsøe and the refinery to access the same application off the same database
- Haldor Topsøe will be able to perform real-time pro-active operational monitoring, simulation and optimization
- Application also puts results and recommendations back into hosted database



Example display

INDUSTRIAL evolution

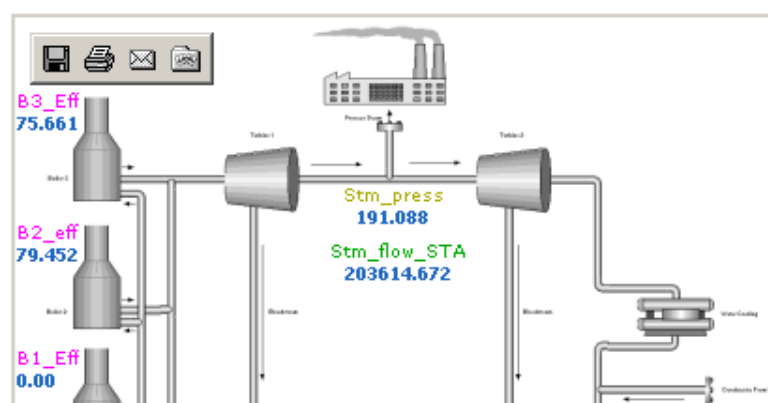
- Technical Information
 - OSisoft/Smith Aquarium
 - About The Aquarium
 - Live Overview Display
 - Software Application Demos
 - InTERstix
 - Map
 - READ ME FIRST
 - Customer "BestPaper"
 - Kennebunk Paper Mill
 - Process Optimization
 - Model "PM 1 STF"
 - Inputs, Actual Our
 - Models
 - PM 1 Schematic
 - Pred. Outputs, Re
 - Knowledge Process Software
 - Read Me First
 - About Knowledge Process Software
 - System Overview
 - Process Overview
 - Process Schematic
 - Process Trends
 - Summary Report
 - (2) Specially Authorized Users Only
 - (3) General Interest
 - (4) User Tools
 - Feedback
 - Feedback

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performance, throughput, energy use, emissions, yield, quality and availability. KPS knowledge discovery tools can transform the data into rules which explain performance variability, and then produce performance improvement rules.

Performance improvement rules are implemented here using the AnyWhere-Advisor web-based subscription service. AnyWhere-Advisor provides operators with actions when needed and management with summaries of plant performance compared with best achievement.

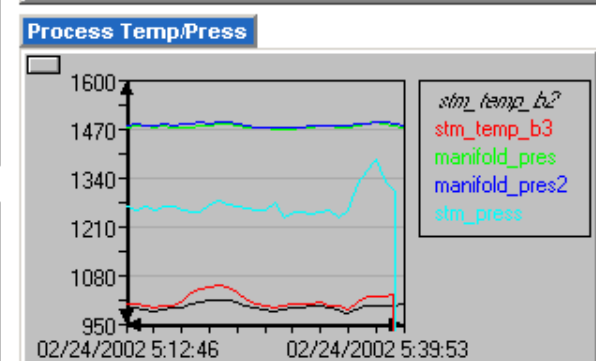
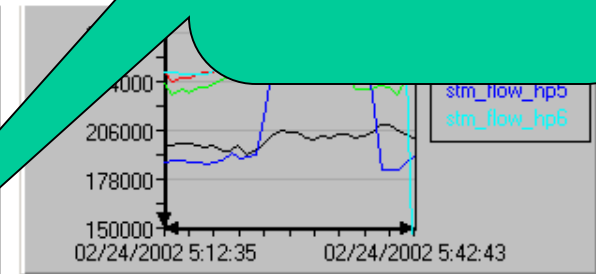
This demonstration relates to a power station supplying steam to an adjacent process facility and electricity to the National Grid. The objective of the advisor is to maximize profit margin whilst ensuring steam levels and qualities are met.



Recommended Actions

24-Feb-02 19:44:31
 Feed_Wtr_Temp = 417.457

24-Feb-02 19:44:01



Profit

Current Profit
Optimal Profit

24-Feb-02 19:44:31
 Estimated Profit Increase of 1.19%
 Boiler 2 efficiency is below expected level
 Boiler 3 efficiency is below expected level

24-Feb-02 19:44:01

Make vs Buy

- Haldor Topsøe
 - Not core expertise
 - Extremely expensive to develop necessary systems
 - Maintaining systems deployed in customer sites expensive
 - Don't want security liability
- Oil refinery
 - Want to maintain competitiveness not build IT systems
 - Don't want to support the systems

Answer is to use a 3rd party service



Industrial Evolution's Role

- Single pipeline of real-time data out of the oil refinery's firewall
- Secure means of sharing data
- Trusted broker of real-time data to 3rd parties
- Systems support and maintenance
- Web technology provider
- Make it cheap for everyone by amortizing infrastructure and software development costs across many customers & suppliers



Benefits Expected

- Haldor Topsøe
 - Gain reputation as best value supplier
 - Win more business
- Oil refinery:
 - Improved operation, reduced catalyst costs
 - Single pipeline of data out (security!)
 - No outside users accessing internal systems
 - No unanticipated loads on systems
 - No additional support or burden
 - Turned strategy on its head and offered the same collaborative approach to its customers





Optyxx – Remote Expert Services

- Millennium Chemicals – world #2 TiO₂ supplier
- Launched new business to provide remote expert services
 - Modeling
 - Optimization
 - Process consulting
- Focus on paper coatings applications
- Initial implementation at MeadWestvaco





AEA Technologies – Environmental Monitoring

- AEA Technologies – UK’s leading environmental consulting firm
- Provides software & services to monitor, ensure and report environmental compliance
- Introducing new web service
 - Uses AEAT’s “MonitorPro” software
 - Linked to PI server
 - Hosted by Industrial Evolution





Knowledge Process Software – Data Mining Application

- Data mining & process optimization
- Application sold as a web service
- Software functions:
 - Automatically scans process data
 - Generates rules to improve profitability
 - Monitors actions vs rules
 - Makes improvement recommendations
 - Assesses economic impact
- Hosted by Industrial Evolution

