Best Practices in Adaptive Manufacturing

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Tata Consulting Services (TCS) Overview

- Part of the Tata Group, one of India’s largest and most respected industrial conglomerates
- Asia’s largest software services company
- Pioneered the global delivery model
- Over 1000 customers worldwide, 41 Delivery Centers worldwide, and offices in 47 countries

TCS is the largest and fastest growing software services company in Asia today
Why TCS as SAP’s Strategic SI Partner of Choice for Manufacturing?

The Engineering and Industrial Services (EIS) business unit of TCS is:

- a “one-stop” global engineering solutions provider
- offering best-in-class technologies, processes, and competencies for:
  - product design,
  - plant design,
  - plant operations,
  - production optimization, and
  - asset management

TCS delivers “one-stop” manufacturing domain expertise in SAP ERP, SAP NW, SAP xMII and real-time plant floor systems
Traditional Models of Open-loop Operations Lead to disconnect between the Plant and Business Processes
Optimized Supply Chain Processes

Objectives:
1. Minimize Wastage
2. Throughputs, changeover times
3. Asset availability

Objectives:
1. Order Fill rates
2. Production costs, inventory costs, Maintenance Costs
3. Capacity Utilization

Objectives:
1. Return on investment
2. Economic Value Added

Increased Business Value

Optimization oriented objectives at higher levels of decision making

Alignment of Objectives to Realize Benefits of Adaptive Manufacturing
Adaptive Manufacturing: Control Systems Analogy

Manipulated Variables
- Throughputs,
- Inventory Levels
- Fuel Flow rate

Controlled Variables
- Energy Consumption
- Order Fill Rates
- Return on Investment

Critical Enablers

Sensors for measurement
- Complete Data-Information-Knowledge chain

Controllers for feedback, feed forward actions
- Translation of real-time information into predictive and corrective responses

‘Sense and Respond’ with Manufacturing Integration and Manufacturing Intelligence

Integrated Information Delivery
Challenges for realization of value

Disconnect exists across enterprise and plant systems
- Different processes, KPIs
- Multiple versions of information

Diverse platforms / technologies
- 20-50 Shop floor automation systems in a typical plant

Disconnect across multiple sites poses significant challenges
- Typical enterprise has 40 and 700 SFA systems across its enterprise
- Functional boundaries are not standardized
SAP & TCS Strategic Partnership

Summary

About TCS

Sustaining Six Sigma on the shop floor

Engineering model driven business process execution

Process Integration for a Pet Food Manufacturer

Best Practices in Adaptive Manufacturing

Enabling Adaptive Manufacturing

Summary
Composites and Solution Templates

Composites to fill white spaces

- **Sensing challenges**
  - Key variables are not measurable
  - Delayed feedback

- **Decision support engines**
  - Suitable feedback and feed forward control strategies
  - Capture and automate operational expertise that resides with SME

- **Process uncertainty**
  - Process dynamics
  - Variability with time

**Develop Accelerators**

- **Vertical-specific Composites**
- **SAP xMII templates to address industry specific problems**

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Schematic for composite deployment in process plant management
**TCS’ Composite for Condition Based Maintenance**

Combine Engineering Domain Models within Business Process Execution

**Configurable**
- Equipment model selection
- Field parameter selection
- Field values monitoring frequency
- Threshold condition monitoring logic

**Scalable in terms of**
- Health check index model
- Equipment or functional location under consideration
- Number of sensors per equipment/functional location

**Working with a Client in Energy Domain for Realization of the Composite**
Create Virtual Sensor for Equipment Health

- Engineering Model Selection
- Setup Operational Rules for Best Practices
- Bind with Real time Data Sources
Templates to address industry specific problems

- Dashboards for Chemicals, Hi-Tech, Pharmaceuticals

Composites built from proven components to address ‘white spaces’

- Rapid Sigma
- Proactive Maintenance

Building blocks for quick realization

- Library of reusable components
  - Audit Trail
  - BOM Explosion
  - Maintenance Notification...
- Library of validated Models
- Best in class algorithms for decision support
Rapid Six Sigma – Enabling sustained Improvement Initiatives

Shop floor team is not Six Sigma savvy
- Inadequate understanding of the Six Sigma Concepts
- Non availability of easy to use tailored tool
- Inadequate systems to track and control the improved process

TCS’ Rapid Sigma
- Easy to use composite on SAP xMII
- Cuts down time to ‘Measure’ to near nil.
- Guided Procedures for process conformance and continuity
- On-line tracking and monitoring for sustaining the improvements

Data management issues
- Data Availability
- Data integrity
- Data extraction from ERP and other interfaces
- Data integration from various legacy system
Significance of co-relation calculated based on predefined rules (like p < 0.05 etc.)
Pet Food Manufacturer: Automating Formula Change Management Process

Reduce Time to Deliver Recipe Changes to Production Personnel

Challenges

- Formula change information spread across multiple systems (SAP ERP, Proprietary Databases)
- Information flow through multiple channels (fax/hardcopies, e-mails, telephones)
- Validation workflow involved multiple entities

xMII Solution Highlights

- Automated Workflow to route the change approvals with mail notifications
- Automated compilation and comparison of changes based on data from multiple systems
- Audit Trail – Implemented through TCS’ solution accelerator
- Electronic Signatures to track changes in formulation

Next Steps

- Integration with the shop floor execution / control systems
- Rollout to other plants
Sample Engagements

- Global pharmaceutical co → production data aggregation and analytics
- Graphite rods manufacturer → MES – ERP synchronization
- Pets food company → recipe change management
- Mining company → enterprise – manufacturing integration
- Flexible packaging major → quality dashboards and analytics
- Utilities company → condition based maintenance
- Food & Beverage major → production process management
- Beverage can manufacturer → manufacturing & plant maintenance dashboard
- Inorganic chemical manufacturer → supply chain – production synchronization
TCS: Delivery Value to Manufacturers Globally with Adaptive Mfg

Delivery capabilities
- Common best practices
- Common standards and methodologies
- Reuse of knowledge across locations
- Global resource availability

Manufacturing systems expertise
- Knowledge of value delivered
- Knowledge of standards
- Knowledge of best practices

System architecture
- Ability to architect robust and scalable systems
- Design and develop reusable templates

Domain knowledge
- Business domain
- Production domain

Technology stack
- Knowledge of technologies from SAP to plant sensor networks

Customer
Thanks !!!

SAP’s preferred Partner for Adaptive Manufacturing

Our Strength

Domain Expertise

Global Presence

Established Processes