Equipment Data Collection ... Simplified

John Harrison – SAP Labs
Keith Lapeyrouse – Process Reliability Solutions
A Multi-Generational View of Data

### Integrated/Structured Data + Data Governance
- Additional software purchases required
- Process Control System data in integrated into the data portal
- Master data is released through the MoC tool is automated ensuring accurate data available in the field
- Integrated data supports advanced Analytics and Prognostic Analysis

### Non-Integrated / Unstructured Data
- Moderate cost software purchases
- Existing paper based documents are converted to structured data in Master Systems.
- A data portal is established to enable integrated data retrieval
- Mobility and positive Functional Location / Equipment Identification drive data quality.

### One Truth ...
- validated but not evergreen

### Integrated/Structured Data
- Process Control System data in integrated into the data portal
- Master data is released through the MoC tool is automated ensuring accurate data available in the field
- Integrated data supports advanced Analytics and Prognostic Analysis

### One Truth ...
- validated & evergreen

### The search for the truth

<table>
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<td>Improving the Completeness and Accuracy of ERP System Master &amp; Transactional Data</td>
<td>Data Supports Maintenance Effectiveness and Drives Equipment Reliability Improvements</td>
<td>Data Supports Product Reliability Improvements</td>
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Generation 1 – Key Concepts

• You can do this now
• ERP is/can be configured to hold the data you need for critical processes
  • e.g. - Safety Instrumented System Failure Rates, Integrity Operating Window excursions
• Metrics define current performance and give leadership visibility as to what need attention
• Much data is manually entered
• Data may not be as accurate as desired
Data Management

According to the Data Management Association: “Data Resource Management is the development and execution of architectures, policies, practices and procedures that properly manage the full data lifecycle needs of an enterprise."

• Problem:
  • Many data sources
  • Data Duplicated across sources
  • Different forms of data
  • Data gets out of synchronization
  • Many different uses of the same data
System of Record

A **system of record** (SOR) or **Source System of Record** (SSoR) is a Data Management term for an information storage system (commonly implemented on a computer system) that is the authoritative data source for a given data element or piece of information.


- **Systems of Record contain many types of data**
  - System Configuration Data
  - Master Data
  - Transactional Data
  - Continuous Data, ...

- **Systems of Record can be in many forms**
  - Paper
  - Digital
  - Drawings, ...
ERP Types of Data

- ERP System Configuration Data
- Master Data
- Transactional Data
- Process Control Data
Data Control = Data Governance

Data governance is a control that ensures that the data entry by an operations team member or by an automated process meets precise standards, such as a business rule, a data definition and data integrity constraints in the data model.

- The data governor uses data quality monitoring against production data to communicate errors in data back to operational team members, or to the technical support team, for corrective action. Data governance is used by organizations to exercise control over processes and methods used by their data stewards and data custodians in order to improve data quality.


Controls Needed for:

- Metrics Definition
- Data Elements
- Predictive Algorithms and Models
- Master Data (Equipment, Customer, Vendor, Location, etc.)
- Transactional Data
- Data Usage (processes)
- Documents ...
Understand Data & It’s Usage

- Master Data
- Transactional Data
- Process Data
  - Data Historian
  - Process Historian
  - DCS
  - Manually collected
- Template Data on Devices

- Business Documents
- KPI / Analytics
- Process Definitions
- Maintenance Procedures
- Transactional flow to another system
- As Master Data in another system
- Data Modelling / Predictive Analytics

Do the data elements have the same meaning on both sides?
If you expect to improve these and other areas...

- Responsive Manufacturing
  - Over all Equipment Effectiveness
  - Energy and Environmental Resource Management
  - Predictive Maintenance
- The Real-Time Supply Chain
  - Demand Signal Management
  - Computer Aided Ordering
  - Price Optimization
- Brand & Channel Management
  - Customer Engagement Intelligence
  - Sentiment Intelligence (RDS)
  - Signal Detection

The data needs to be correct & understood.
Justification for Change

CHALLENGES YOU FACE

- Safer
- More Efficient
- Cost Effective

Inefficient Execution of Operation and Maintenance Tasks (Multiple Silos)

- Safety, Environmental, and Regulatory Compliance to Regulatory and Insurance Bodies

- Increasing Costs for Modifications and Turnarounds

- Knowledge Drain with Turn-over and retirement

Maximizing Economic Recovery
Digital Representation vs. Reality

Trusted Source

Reality
The Journey to ‘Generation 2’

- Data-Centric
- Structural
- Unstructured

- Document-Centric
- Clean
- Synchronize
- Maintain
- Share

House
Intergraph SmartPlant (SPO)

Extract Master Data and Tag/Document Relationships

Data Centric Design Tools (2D/3D) containing Master Data, Engineering Drawings & Documents

2D
3D

Enterprise Resource Planning
Engineering Master Data Management

Automated Work Processes that Manage Engineering Change Management to keep Engineering Data Evergreen.

Generation 2

Intergraph SmartPlant Fusion

Integrated Data, One Truth... Validated

EPC

Intergraph

ERP

SAP

SAP EAM/BoM

Generation 2 – Integrated Data, One Truth... Validated

Paper Documents & Non-Integrated Electronic Documents
SmartPlant Fusion - How it Works

1. Rapidly finds, captures, and organizes large volumes of unstructured information
2. Helps identify masters & eliminates access to duplicates and old revisions
3. Extracts intelligence (Master Data) & creates relationships – Tag to Document, Manufacturer, Model, Asset, FLOC etc.
4. Enables Quality Control to correct relationships, view inconsistencies & fix missing reference files
5. Provides intuitive, single point of access to engineering information
6. Loads approved information into SPO. SPO consolidates Smart Engineering Master Data (2D/3D) with extracted Fusion Master Data and shares with Operational Systems
Cross references and links established for rapid location & navigation of information
SmartPlant Enterprise for Owner/Operators (SPO) – What is it?

- Engineering Data Repository with full integration with Design Tools and SmartPlant Fusion
- Fully Engineering Document Management including transmittals, check-in/out etc.
- Centralized Tag Management for all Tags not just maintained Tags
- Workflows for Engineering Data Change Management – Keeps Data evergreen
- 2D/3D Visualization – Navigation via P&ID/3D Model/Isometrics
- Integration with SAP-PM/BOM
- Electronic Dossiers – Replaces the ‘Wall of Books’
- Engineering Work packages
- Concurrent Engineering
- Business Intelligence Reports
- Add-ons: Systems Completion, Project Execution, Operating Plant, Risk management etc.
Generation 3 – Integrated Information w/Data Governance/Management in SAP

• Master data validated from Gen 2
• Master data managed Via MoC’s
• Data contains the truth
  • Master Data
  • Transactional data
• Process Data is available
  • Configuration data on the Process Control and field devices
  • Continuous data is available as well as discrete events (alarms)
The Challenge.....
Multiple Asset Information Systems of Record

- Engineering Data Warehouse (EDW)
- Enterprise Content Management (ECM)
- Enterprise Asset Management (EAM)
The Challenge.....
Continually Changing As-built Asset Information
The Challenge.....
Multiple Information Formats & Structures

- **Equipment**
  - Lists
  - FLOCs
  - BOMs
  - Assemblies
  - Task lists

- **Data**
  - Engineering Data
    - Warehouse (EDW)
    - Coordinated MoC
  - P-300-27
  - D-300-2003 P&ID
  - Electrical Piping Risers
  - 3D Models

**Asset (Object)**

- **ID**: P-300-27
- **Type**: CPump
- **DFlow**: 200 CFM
- **PR**: MAX 3.5
- **Material**: Ni-222

**Document Formats**
- Paper
- Image
- DWG, ...
- XML
- Std XML
- ...

**Organized by Documents**

**Data Formats**
- Proprietary
- RDB
- Object DB
- XML
- Std XML
- ...

**Organized By Object**

**Document Formats**

**Data Formats**

**Document & Data Linkages**

- Synchronized with As-built
- Synchronized with As-built
- Synchronized with As-built

**Drawings**

- P&ID Electrical Piping Risers
- 3D Models
- ...

**Documents**

- Manuals
- Operating Procedures
- Maintenance Procedures
- Data Sheets
- Warranties
- ...

**Data**

- Equipment lists
- FLOCs
- BOMs
- Assemblies
- Task lists
- ...

**Organized by Documents**
Equipment Masters,
Material Masters,
Maintenance Plans,
Strategies, BOMs, etc.

Asset Information Staging Area

SAP & OpenText Technology
Utopia Team & Methodology

Validation, Transformation, Enrichment & Approval Processes Determined by Document Type & Context

MRO-Relevant Documents, Transformation Artifacts & Audit Trail

MRO – linked Intelligent 3D Models

MRO Operating Environment

ECM
EAM
EDW

Enterprise Visualization
Lifecycle Asset Information Management for Structured & Unstructured Data

Multiple Operating Windows & Use Cases

Large-scale, Long-term Projects

Characteristics
• Long duration planning
• Complex data sets
• Numerous stakeholders
• Complex processes
• Multiple ‘what if’ scenarios
• Dashboards & progress reporting are essential

Typical Use Cases
• Capital Projects
• Turnaround Planning
• Mergers & Acquisitions

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Typical Use Cases
• Capital Projects
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• Mergers & Acquisitions
SmartPlant Engineering Release provides approved engineering master data and initiates MDG Change Request.

xECM 2D & 3D maintenance aids.

Change request initiates creation of EAM Asset Master Data Objects.

Equipment Masters
Material Masters
FLOCs, Work Centers, Task Lists, Meas Pts, Production Resources, etc.

EAM Workbench delivers standardized content from Owner's Best Practices Library.

Asset Intelligence Network provides enriched content using data from manufacturer, supplier, and user community.

Completion of Master Data Governance workflow invokes loading of production EAM & Engineering systems with updated master data and related documentation.

Maintenance Master Data (linked to SAP business objects)

Equipment Masters
Material Masters
FLOCs, Work Centers, Task Lists, Meas Pts, Production Resources, etc.

Documents (linked to SAP business objects)

Maintenance Aids (linked to SAP Business Objects)

2D & 3D Maintenance Aids

MDG

2

Project Workspace

Equipment Workspace

Material Workspace

Other PM Workspace

xECM manages "early" workspaces for each corresponding object, linked to MDG objects.

xECM moves documents to staging workspaces.

Micro Focus Visual Enterprise

Engineering Master Data

Engineering Change

Asset Intelligence Network

Equipment Workspace

Material Workspace

Other PM Workspace

Maintenance Aids Workspace

Engineering Master Data

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EAM Workbench (Best Practices Library)

Specifications

Revisions / Service Bulletins

Maintenance Strategy / Intervals & Tasks

Materials

PM

SmartPlant Engineering Release also provides unstructured data for ECM and materials for Maintenance Aids.

Change Request initiates creation of EAM Asset Master Data Objects.

EAM Workbench delivers standardized content from Owner's Best Practices Library.

Asset Intelligence Network provides enriched content using data from manufacturer, supplier, and user community.

Completion of Master Data Governance workflow invokes loading of production EAM & Engineering systems with updated master data and related documentation.

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Can Maintenance & Engineering develop processes where data is evergreen?

Generation X – Data Collection Simplified

- EPC (Engineering, Procurement, Construction)
- RFID
- Engineering Drawing & Documents
- New Construction Handover
- Functional Location
- Equipment

SAP ERP

Enterprise Resource Planning

Engineering Master Data Management
Data Collection and Transactional Data Quality Improvement

- Use Functional Locations that describe the function and not the equipment
- Install equipment in the functional locations
- Use alternate tags
- Positive Functional Location and Equipment Identification for Transactions
Data Collection – The new frontier

Source: ThinkStock™
Used with permission of Emerson Process Measurements™ & Beamex™

Mary Kay O’Conner Process Safety Center - 17th Annual International Symposium - In Association with IChemE
Data Collection – The new frontier

PC Tablet with Hart Modem
CCPS Vision 20/20 and Master Data

Disciplined Adherence to Standards

Enhanced Application & Sharing of Lessons Learned

Harmonization of Standards

Source: CCPS Vision 20/20 AIChE 188-14 • Rev. 0 • 06.14
Pick Your Driver

- Cost Avoidance on Mega Projects
- Knowledge Retention of Aging Workforce
- Accident Avoidance
- CCPS Vision 20/20
- Performance monitoring is increasing in presence in Codes and standards
- Changes in regulations and interpretations
Close

• Is now the time?
• Have we answered the question “What does a Multi-generational approach to data collection look like?”
• Where are you on your data journey?
• What are your questions
John Harrison is a senior solution specialist with SAP Chemical Industry Business Unit. John has over 20 years experience in process industry where he has been instrumental in the design and implementation systems for the manufacturing, logistics, maintenance, quality management, and costing areas. Within the SAP Chemical Business Unit he is responsible for Manufacturing and Enterprise Asset Management solutions. John holds both the CPIM and CIRM designation from the APICS society, along with a Bachelor’s of Mathematics from the University of Waterloo, Canada.
Mac McGarrigle – Enterprise Business Process Consultant and part of the Intergraph Global Accounts Team. More than 47 years’ experience in the Process, Power, Mining, and Marine industries. Mac provides strategic Information Management consulting services from best practice Project Execution and Technical Information handover to on-going Operational improvement opportunities for Owner/Operator clients globally. Intergraph calls this strategy ‘Safe, Sustainable Engineering and Operational Excellence’. This includes not only the Intergraph SmartPlant suite of software but also ensuring that Data is shared with SAP, Reliability, Inspection, and Control System via integration to support those Operational Systems with Master Data.
Generation 3 – Integrated Information w/Data Governance/Management in SAP

Mike Jordan is the Vice President of EAM Practice at Utopia, Inc. Mike is a Professional Engineer with more than 30 years of experience in systems engineering, and program management associated with automation systems in asset-intensive industries. Through extensive engagements with industry leading Engineering, Procurement & Construction Companies, as well as Plant Owner/Operators, Mr. Jordan has developed an interesting perspective on the challenges faced in asset lifecycle information management.
Introduction

• Keith Lapeyrouse is a Sales and Technical Consultant for Process Reliability Solutions. He has worked within the petrochemical business in inspection, maintenance, reliability, project, consulting engineering and now IT tool development groups and functions for the past 35 plus years. He is a member of the steering team for the Mary Kay O’Connell Center for Process Safety’s Instrument Reliability Network. He is a Registered Professional Engineer in Louisiana and has a B.S. in Mechanical Engineering and a M.S. in Engineering Science.