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Transforming Knowledge into Performance

Procedures and OSHA CFR 1910, 20 years later

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– Senior Client Executive with Innovatia

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Beginning with their earliest forms, procedures have been developed as a mechanism to train personnel in the operation and maintenance of processing units. Procedures represented a means of capturing the knowledge of an organization, where more senior personnel developed procedures to guide junior members. This presented an issue. Senior personnel were writing procedures based on their own experience, not necessarily based on best practices for safety and efficiency. This loose management of design requirements and accrued expertise contributed to a periodic stream of spectacular industry failures as preventable mistakes were repeated.

This contributed to OSHA's development of the initial CFR 1910 Process Safety Management (PSM) regulatory scope twenty years ago. Manufacturers initially embraced the philosophy that "something was better than nothing" as procedure compliance in the 90's was measured by the number of binders and the pounds of documentation per process unit. With infrequent updates and poor organization, this documentation provided little more than minor improvements to the unit's maintenance routines. Although they were poorly created, perpetually out of date, and difficult to access when needed, these procedures enabled the organization to comply with the PSM regulatory requirements.

In later years, green-field construction projects provided opportunities for a renewed focus on improving procedure quality as a means to train new operations personnel. Manufacturers looked towards ways to capture the expertise of their senior personnel as the industry began to prepare for the "Great Shift Change" as senior leaders within the organization retired. Procedures were developed in greater detail and scope, requiring a significant commitment of resources to write and maintain them over time. The PSM regulatory compliance now required procedures to be certified annually, requiring manufacturers' to consider ongoing maintenance of the procedures.

Advancements in word processor software tools enabled writers to produce procedures more effectively while establishing a crude management of change (MOC) process with the digital files. The evolution of software wizards and templates enabled armies of procedure writers to produce documents with similar appearances for use by larger groups of operations personnel across more process units. The quality of the procedures improved, as did the quantity, but their impact on process improvement was only implied since there was no ability to measure use through audit trails. Although the hard copies of the procedures filled binders or were printed on demand, the growing library was facing a cliff of obsolescence. Even displaying the procedures on a field PDA or laptop computer could not deliver the true value of digitization because of the constraints of the scripted document formats.

Operational Excellence and Reliability programs at a key refining operation focused on the elimination of unplanned events adversely impacting site performance. A recent assessment by this refinery indicated consistent losses exceeding $6M per year over a five year period[1]. Assessment of these events revealed that poor procedures or the lack thereof played a key role in this result. *(Fig. 1)*

This observation led to the development of Operator Driven Reliability (ODR) programs targeting the plant assets. Clients felt that "Operations can have a bigger impact on asset reliability than our maintenance department"[2]. ODR programs emphasized operator activities to improve reliability through the deployment of asset-level operating procedures. Although a typical refinery site may

1% Incorrect Sequence
1% No Check-off
1% Ambiguous Instructions
2% Procedure too Difficult
4% Wrong Revision
4% Check-off Misused
5% Undefined
7% Wrong Information
7% No Details
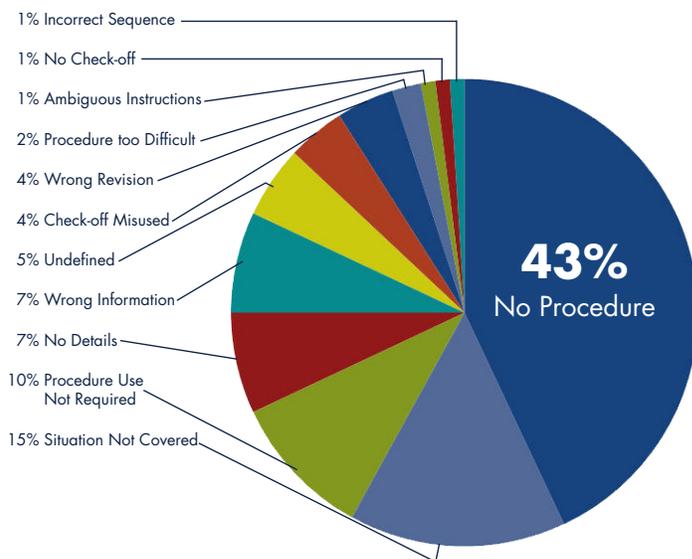10% Procedure Use Not Required
15% Situation Not Covered

43% No Procedure

Fig. 1: Causes of site safe incidences as reported through the Operator Driven Reliability Program at a large-scale oil refinery.

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already have several thousand operations procedures, the requirement to develop unique procedures for each asset - with four procedure types per asset and 60,000+ assets - produced a project scope requiring 900 man years to complete with conventional procedure development technologies. The procedure development for just the 2,700 rotating assets at the refinery would require 45 man years to complete.

Introducing Single Source authoring technology

The Single Source authoring technology introduced by Procedure Accelerator consists of a statement being written once, and deployed multiple times throughout the library of procedures for operations and maintenance activities. *(Fig. 2)*

Statement Database	
1. Install check valve	
2. Open bleeds to collection	
3. Purge bundles to flame	
•••	
17. Disable automatic pump start	
•••	
22. Leave vents and drains open	
•••	
90. Open lines to steam trap	
•••	
125. Verify vacuum seal	
126. Shut down main line	

Pump A24—Start-up
17. Disable automatic pump start
22. Leave vents and drains open
90. Open lines to steam trap

Compressor B3—Bypass
22. Leave vents and drains open
38. Commission Seal Pot
293. Bypass Hot Slide

Pump A24—Prep for Maintenance
8. Close and tag suction block valve
22. Leave vents and drains open
90. Open lines to steam trap

Exchange D21—Shutdown
90. Open lines to steam trap
101. Shut off steam
252. Verify lube supply

Pump A55—Start-up
5. Purge to flare
17. Disable automatic pump start
158. Open, lock and tag motor breaker
•••

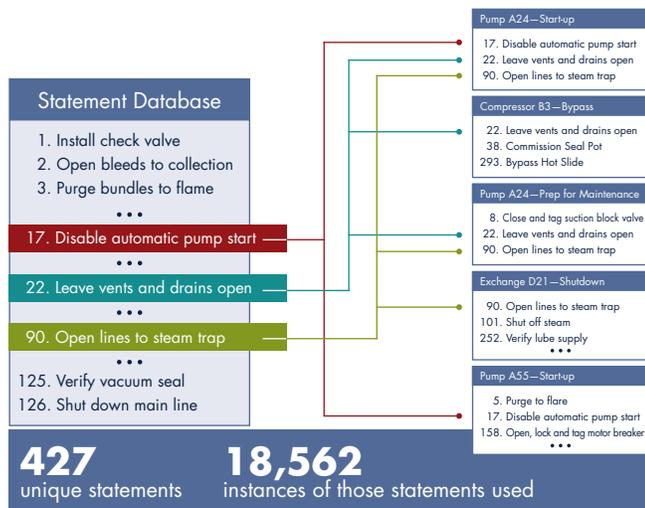**427** unique statements   **18,562** instances of those statements used

Fig. 2: Showing how single source authoring can be used to build procedures.

Innovatia's Single Source technology originated in the Telecommunications industry. This technology enabled large-scale telecommunications manufacturers to address documentation requirements for multiple products with the ability to adapt the product support information across multiple outputs.

This Single Source technology has since been adapted for the process industry using three parts: a database of statements, asset templates and procedure templates. This is the higher level of single source logic, which captures knowledge across the organization to apply not only content, but also to context. This Single Source technology has the ability to recognize when a step is missing across asset types based on contextual characteristics. As a result, multiple asset-level procedures can be created simultaneously by defining the attributes of a single asset. This is in stark contrast to the historical approach of manually writing scripts for procedures, which was a time-consuming process. The result is a ten-fold productivity improvement. Procedures are now produced within minutes, not days.

This level of procedure digitization delivers accurate and up-to-date procedures across multiple sites through integration with an Enterprise Asset Management system. This system helps to deliver the level of granularity required to track the step-by-step procedure execution by operators and the on-going maintenance of those procedures, ensuring individuals are using the most accurate, efficient, and reliable procedures available.

This data structure now delivers the full value of digital procedures including:

- Deployment on handheld PDAs
- Wireless deployment
- Embedded graphics and videos
- Management of Change (MOC) process
- Instant deployment of the most accurate, most current procedure
- Integration with Enterprise Asset Management systems
- Step-by-step procedure execution tracking
- Audit trails for reliability and event analysis including when the last time an asset was maintained, which steps they completed, and a chain of custody on that process from when it was written to each time it was successfully used.

The application of Innovatia's Single Source authoring technology to the ODR application reduced the deployment effort from the projected 45 man years to less than two. The application has now been online for two years, saving approximately $2M over a 12 month period, with the incident reports trending lower. The system is now being extended to other areas and assets.

The process industry's embrace of Single Source authoring technology is enabling clients to deploy tens of thousands of Operational Excellence and Reliability procedures to their personnel. The full value of the original Process Safety Management vision from twenty years ago is now being delivered through the deployment of these digitized procedures.

1) Porter, Mark – "Operator Driven Reliability at the Irving Oil Refinery" - Hydrocarbon Processing Magazine newsletter – 2012 AFPM Annual Meeting
2) Porter, Mark – 2011 Emerson Exchange presentation – "How Operators Drive Reliability at Irving Oil"

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