

New Method for Asset Data Capture in the Oil & Gas Industry

By Brian Maier, Consultant, Emerson

The oil and gas pipeline industry, though tempered by the cost of oil recently, has seen a significant amount of growth over the last ten years. One of the challenges facing growing companies is ensuring that asset records □ which are installed into a Computerized Maintenance Management System (CMMS) or Enterprise Resources Planning (ERP) □ are accurate and consistent. A major oil pipeline company faced this challenge in 2014 when their Master Equipment List (MEL) had ballooned to over 200,000 assets since the installation of their CMMS in 2012. Each year, 10,000 to 20,000 asset records are put into service. For small projects there can be 300 to 1,000 assets added, and for large projects there can be anywhere from 3,000 to 5,000 assets added. Much of the data in the company's system was inconsistent, lacked content, or was for an item that should not have been considered an asset. To help tame their asset data problem, the company contracted Emerson Process Management (Emerson) to provide a vehicle to enforce quality control on data being entered into the CMMS and to create a process to manage how and what asset data is entered.

The pipeline company had been using a process where the functional locations were pre-developed based on project requirements, and the Engineering, Procurement, and Construction (EPC) firm that installed the equipment input the asset data directly into the CMMS. The pipeline company liked that they did not have to provide resources to input the data, and the EPC had access to vendor documentation from the project team. However, the lack of controls in place led to an increasing amount of inaccurate data populating the system. In total there were five EPCs involved with various projects across the company. The maintenance team in Canada was responsible for coordinating the data entered by the EPCs and for developing functional locations where the EPC could assign and enter asset information based on the functional location. There were different processes in place in the United States than in Canada. In the United States, the EPC collected asset data from the nameplate during field verification of the asset. In Canada, however, the EPC collected asset information from the vendor, and that initial data was entered into the CMMS. At field verification it was tagged, verified against the functional location, and the serial number information was added to the data record.

There were advantages and disadvantages to both methods. In the United States, asset information was recorded by data entry clerks based on data sheets provided by field verifiers. The data coming from the nameplate was set into a PDF that had selectable asset classes and subclasses, which then allowed entry into pre-established attribute fields based on the class and subclass selected. The PDF, once completed, was sent to the EPC office for entry into the CMMS. The advantage was that all of the information was true and accurate because it was based on the nameplate and was developed by an engineer in the field who was knowledgeable about the equipment. The disadvantage, however, was that numerous data entry clerks could, and would, enter the data based on rote entry of what they saw on the PDF. This caused inconsistencies in the data, and in some cases inaccuracy, because there was no quality control over the data being entered. For example, on one data sheet a motor horsepower was represented by 200 HP, but on other sheets it was represented as 200HP or 200 Horsepower. In addition to the data inconsistencies, there may have been inaccurate technical information derived if a technically knowledgeable individual was not performing the data entry. For example, if a v-belt size was listed in the attribute BELT SIZE and a value in the attribute DRIVE TYPE of DIRECT, a technically knowledgeable individual would challenge either the DRIVE TYPE or the BELT SIZE values. Data clerks typically do not have the technical acumen to fact check values like this. Finally, there was no control or definition of what was considered an asset, and once an asset was created in the CMMS it could not be removed.

In Canada the practice of the EPC was to gather the vendor data, create the asset in the CMMS, assign the asset to a project location, and add the relevant specification data based on the vendor sheets. Once the asset was verified in the field, it was moved to its corresponding functional location, the serial number information was added, and the asset information was considered complete. In this process, there should have been two quality control points – first after the vendor data was entered and second when confirmation of nameplate data in the field was completed. Since there were no guidelines about how the data should appear in the record and there was no quality control process at either step of the data entry process, data inconsistencies and inaccuracies resulted in varying data quality in the CMMS. In addition, because there were no clear guidelines about what was considered an asset, there were numerous assets that should not have been in the MEL.

Another factor contributing to inconsistent data in both countries was specification templates that were too generic for a specific class of equipment. For example, all the pumps had a single set of specifications when there should have been separate sets of specifications for centrifugal pumps, gear pumps, etc. This lack of a class and subclass structure along with generic specifications prevented the company from having a clearly defined Failure Modes Effects Analysis (FMEA) and Reliability Centered Maintenance Analysis (RCMA). This, in turn, limited the company's ability to optimize their preventive maintenance (PM) based on their evolving predictive maintenance (PdM) programs.

To create controls for the data being entered into the CMMS and ensure consistency and accuracy, the pipeline company and Emerson worked together to identify several areas that could be improved. These areas included:

- Identifying what would be considered an asset in the CMMS.
- Developing asset classes and subclasses with appropriate specification fields to meet data requirements.
- Developing a consistent process for the pipeline company and the EPC to follow in both countries.
- Developing a buffer for the data, so there is quality control of the data before it is moved into the CMMS and developing a tool to seamlessly move the data from the buffer to the CMMS.
- Creating a Data Rules Set to document all data requirements for an asset and functional location.

To understand why there was a need to identify what should be considered an asset in the company's MEL, one only needs to look at the assets that were in the MEL prior to this initiative. Of the more than 200,000 assets in the MEL, there were over 6,000 instances of programmable logic controller cards in the data. There were 2,100 temperature elements, numerous bourdon tube gauges, small motors not requiring asset history, small CO2 fire extinguishers, etc. The overriding objective is to track history on equipment from cradle to grave, but does a 0.75HP motor need to be a record? Should specific maintenance be performed on this equipment? Will it be repaired if needed? In many cases, equipment records at the company should never have been created; instead, an ITEM number should have been associated with the parent's record on the spare parts or Bill of Material list. To help resolve this issue, Emerson developed a specific listing of what types of assets would be allowed into the MEL going forward in order to ensure their asset management practices were aligned with the business needs. We also created a list of questions that must be asked when the EPC encounters an asset that is not on the list. If any of the questions are answered as a "yes," then the object is considered an asset. These questions include:

- Does the item/asset cost more than \$25,000, provided it is not already identified as a component of an existing asset?
- Does the item/asset require a recommended spare parts list?
- Is the item/asset a critical safety device?
- Does the item/asset require preventive maintenance or maintenance required by regulatory agencies?
- Does the item/asset have a nameplate with a serial number?
- Is the item/asset a leased asset on which the company performs safety checks?

After defining what an asset is, the company needed to establish taxonomy to provide a better structure for classifying assets. Taxonomy is a data structure that allows for consistent classification of a place, thing, item, or idea managed by a system. What taxonomy means for a company is that the data structures for all of the assets across the system have a single methodology for classifying information¹. The importance of having a taxonomy in place cannot be overstated because it provides the data necessary to support the development of PM and PdM for an asset, the assignment of an FMEA specific for an asset type, and the creation of a failure hierarchy. New classifications were developed with subclasses and attributes. A noun and qualifier structure provided the asset class/subclass that could be assigned to an asset. For example: pump, centrifugal; pump, gear; transmitter, flow; valve, ball; etc. Attributes were provided for each class/subclass that provided additional information for that asset and unique data for the class/subclass. Emerson provided selectable values for each of the attributes to facilitate quicker entry. The gains in efficiency were 20% for the EPC. This, in turn, provided a cost savings to the company. These values, known as domains, are fixed so that only a value in the list could be used. This also provides a means to ensure that the data is consistent. In figure #1 the relationship between the class, subclass, attributes, and domains are shown.

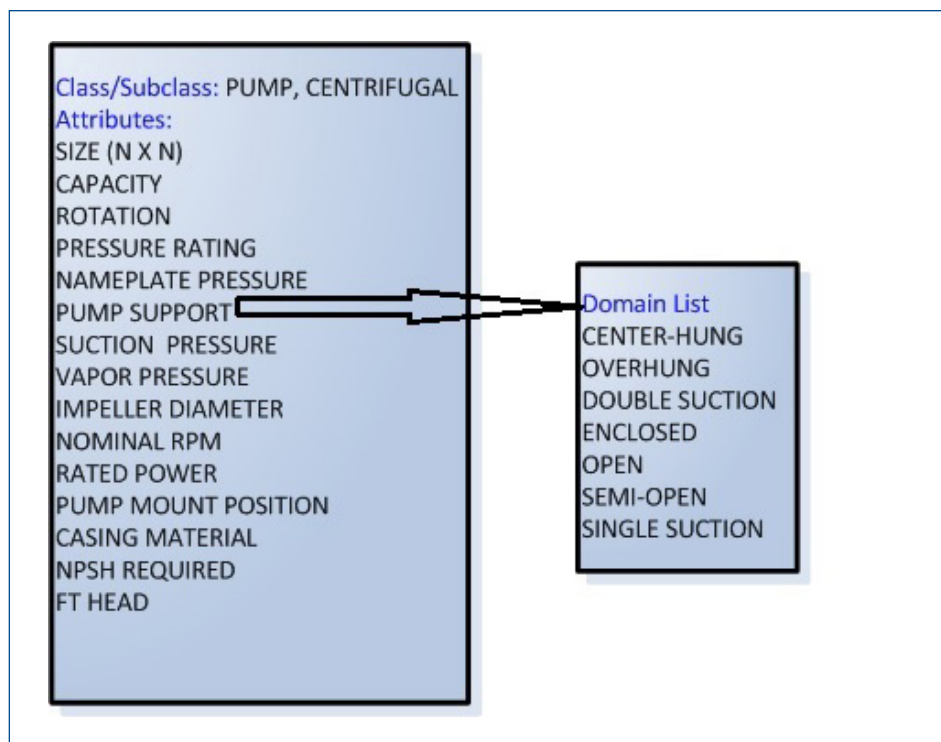


Figure 1 — Class/subclass Attributes and Domains.

¹ DiStefano, Robert S., and Stephen J. Thomas. Asset Data Integrity is Serious Business. New York: Industrial Press, 2011. Print.

To provide a means for asset and location entry for the EPC without direct entry into the CMMS, in this case Maximo, Emerson employed its proprietary tool to facilitate data entry. This tool, Catapult™, allows for quick entry, asset classification and attributes assignment, and drop-down domain values in the attributes. Utilizing third-party software from Mtell, based out of San Diego, CA, Emerson was able to provide a connection from Catapult directly to Maximo. The “adapter” allowed Catapult to connect from a remote server into the Maximo server at the company. As shown in Figure #2, this “adapter” provides the ability to connect to either Maximo or SAP.

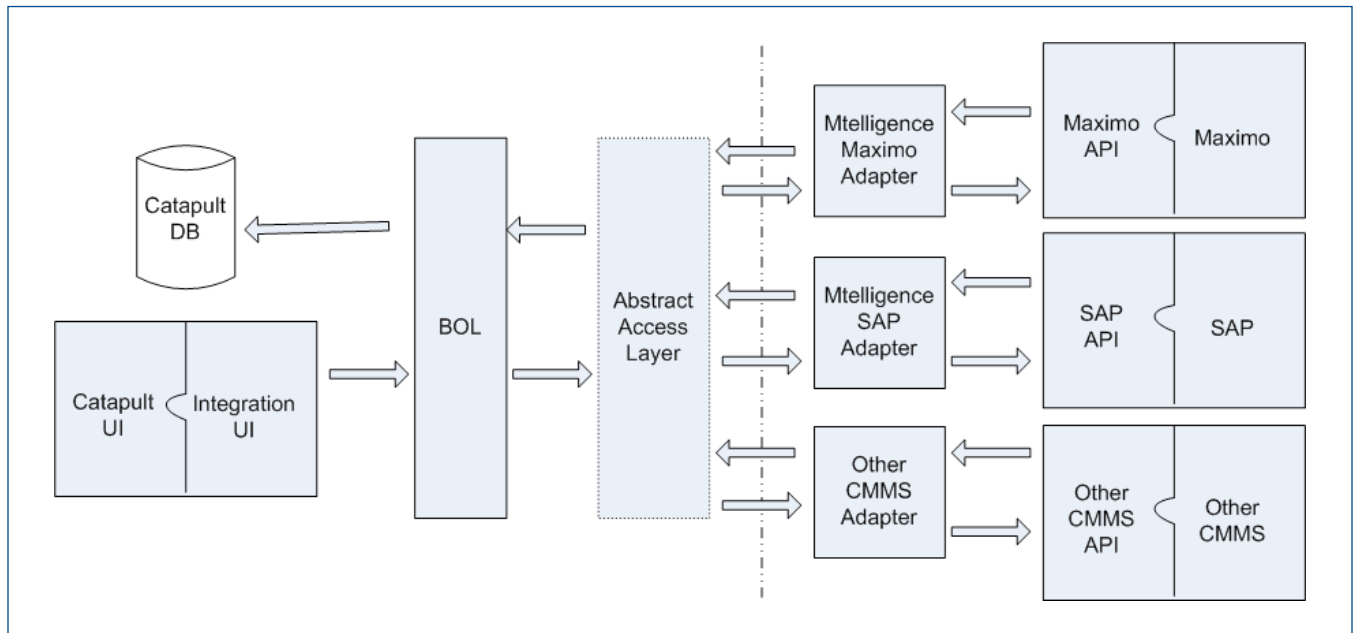


Figure 2 – Catapult Adapter Architecture.

Using Catapult in conjunction with the adapter software was a key differentiator for the project because it provided a vehicle for data entry, a rapid description developer, and a method for ensuring quality prior to the data being “pushed” into Maximo. The EPC is able to track what assets are entered and perform quality control on the data. The pipeline company and the EPC can now track the amount of time necessary for asset creation — which is a 30% reduction in time when the assets are entered directly into Maximo — and assets can be approved or rejected by the company if they do not meet the asset definition rules. In addition, a methodology was provided for performing quality control on the data for the assets. Each EPC received a document that contained the procedures and training information on the use of Catapult. Detailed training was provided at each EPC using the tool. The software setup also enabled the pipeline company to “pull” data from Maximo in order to perform data cleanup of assets already in Maximo. Asset screens for Catapult are shown in Figure #3 and Figure #4.

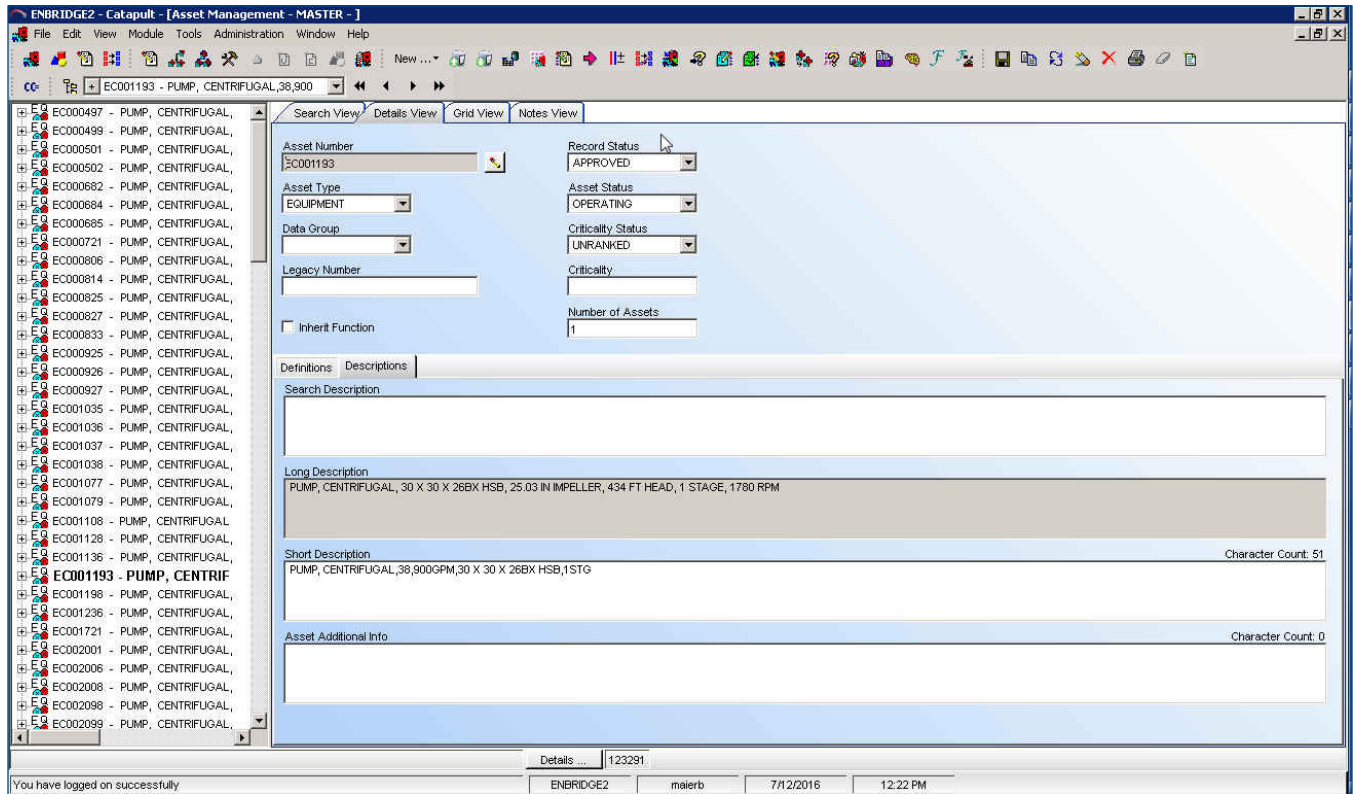


Figure 3 – Catapult Asset Management.

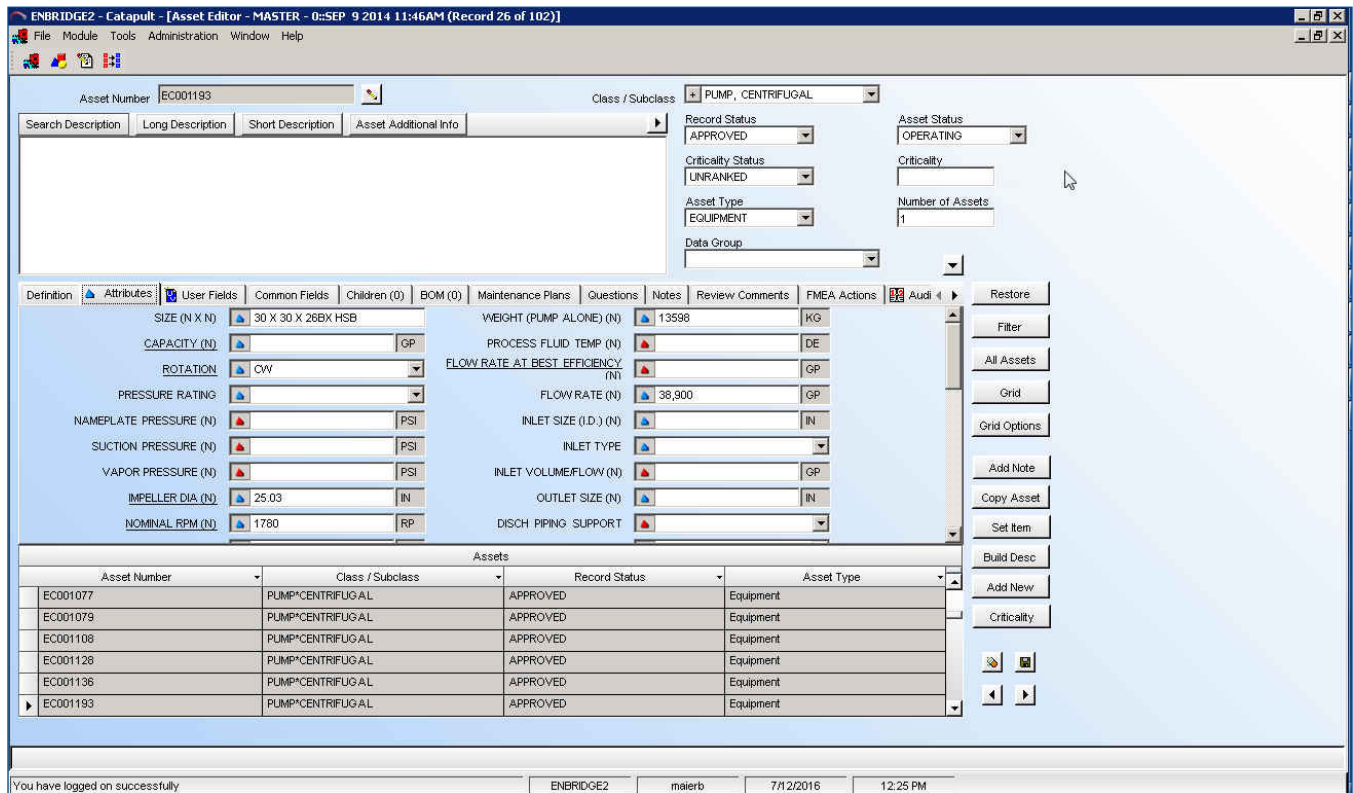


Figure 4 – Catapult Asset Editor.

To ensure data is consistent and entered into the right areas, a Data Rules Set (DRS) was developed. The DRS provided the initial framework for other rules sets that governed Maximo. The pipeline company began the process of setting up Master Data Management (MDM) processes for Maximo, and establishing the DRS lent credence to the process. The DRS provides rules for what an asset record should contain, the format of the individual fields, field lengths, and standard abbreviations, which all help standardize the data entries. For example, in fields where a decimal value is used, the DRS established that value would be preceded by a zero. If a value for motor horsepower is .75 HP, the value entered will be 0.75 HP. Establishing the DRS enabled the team to ensure specific data elements were being captured by the EPC. This included physical data, dimensional data, technical data, and reliability-focused data. Physical data describes at a high level what the asset is. Dimensional data relates to the physical dimensions of the asset. Technical data addresses the technical aspects of the asset to provide the user with specific information that is often needed for repair and/or replacement. Examples include drawings, P&ID identification, material types, etc. Reliability-focused data provides the user with data concerning the reliability associated with the asset¹. These include trend points, lubrication requirements, etc.

With the new processes and tools in place, the pipeline company can now track data on all of their projects, and they have made process safety information available for Pre-Startup Safety Reviews. According to the Canadian Association of Petroleum Producers (CAPP) in its Crude Oil Forecast, Markets and Transportation Report, Canada's oil supply will soon greatly exceed its pipeline capacity of 4,000,000 barrels per day. An additional 850,000 barrels per day is expected from the oil sands by 2021, requiring additional pipeline infrastructure. Prior to this initiative, the company was beset by numerous data inconsistencies, some inaccuracies, and a large amount of asset records that should never have been in the CMMS. Today the company is at the forefront of the Canadian pipeline industry and having clean, accurate, and properly classified asset data will enable them to quickly develop regulatory requirements for those assets and develop programs for better reliability.

Emerson
Reliability Consulting
1100 Louis Henna Blvd
Round Rock, TX 78681 USA
☎ +1 888 889 9170

🌐 www.emerson.com/opcertcon

©2018, Emerson. All rights reserved.

The Emerson logo is a trademark and service mark of Emerson Electric Co. All other marks are the property of their respective owners.

The contents of this publication are presented for informational purposes only, and while every effort has been made to ensure their accuracy, they are not to be construed as warranties or guarantees, express or implied, regarding the products or services described herein or their use or applicability. All sales are governed by our terms and conditions, which are available on request. We reserve the right to modify or improve the designs or specifications of our products at any time without notice.

