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ANTHOLOGY OF ONTOLOGY

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The Need for Context in Information Exchange

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Abstract

This section introduces the concept of Context. When we exchange plant information with traditional methods we rely on context to retain meaning. Information in ISO 15926 format is rich enough that we no longer need context to retain meaning.

How it Used to Be

When your humble author started his career in plant design, computers were not commonly used by designers and engineers. Drafting was by pencil on paper. Specifications were written with a typewriter. When information was transferred from one document to another the only way was for a human to read the original document, find the value to be transferred, then write it by hand on the target document. If the target document was something like a specification it was usually given to a secretary for typing.

Transferring information from one storage location to another was cumbersome, but conceptually simple--you would take all the specifications and drawings, sort them into some logical order, perhaps bind them into books, and move them to the new location. Data turnover to the client at the end of a plant design project was similar to the last scene of the movie *Raiders of the Lost Arc*. In that scene a forklift carried a wooden box down a long aisle of identical wooden boxes and put it on one of the piles. In the real world it sometimes took years for the owner to review all the boxes and categorize the binders of information.

No one really liked this (as in: "I really liked that piece of chocolate cake, may I have another!"), but that was just the way it was. It started to change with computers made their way into the design office. Binders of data sheets gave way to spreadsheets burned onto CDs, graphite pencils gave way to electronic pencils (i.e., CAD), and rolls of mylar drawings gave way to CAD files burned onto more CDs.

Current Situation

There have been improvements, but things haven't changed much conceptually. In our work processes for plant design or plant operations, a large proportion of an engineer's activities still involve manually transferring information from one document to another. For instance, after the engineer chooses, say, an instrument, the only practical way to record the information about the instrument is to read the manufacturer's data, interpret it to decide which of the data values to transcribe, then figure out where to put the data values in the plant design system. Some of the operations are simple transcription, such as transferring a model number from one spot to another. But some involve calculation, such as changing from one unit of measurement to another. Others involve interpretation ranging from ignoring the data value altogether to decisions involving judgment, such as orientation or handedness. The work is done on a computer, but often the only real difference is that engineers do the typing themselves instead of giving it to their secretary.

Why we Need Context

Suppose you have to transfer information from one data sheet to another and you see this:

| 1034 |

This means nothing. So you "back up" and look for more context.

| **Pressure:** 1034 |

OK, so you know a bit more, but still nothing usable.

| **Pressure:** 1034 kPa |

Now you expect other values to be in SI units, but you still really don't know what is going on, so you "back up" some more.

| **Seal Flush** |
| **Pressure:** 1034 kPa |

You still have questions so you continue to "back up".

| **Tag No:** P-101 |
| **Service:** Chemical Injection to D-101 |
| **Seal Flush** |
| **Pressure:** 1034 kPa |

Now you are getting a clearer picture. When you "back all the way up" and read the entire data sheet you can finally put the initial value, 1034, into context.

Centrifugal Pump Data Sheet
Client: ABC Chemical Company
Tag No: P-101
Service: Chemical Injection to D-101
...
Seal Flush
Pressure: 1034 kPa
...

Without context, we are lost.

The Data Sheet Problem

Figure 1 shows sections of two centrifugal pump data sheets. One data sheet might be from a manufacturer's Internet site; the other might belong to the plant owner. It is an engineer's job to interpret the manufacturer's data sheet and transcribe the correct values to the project data sheet.
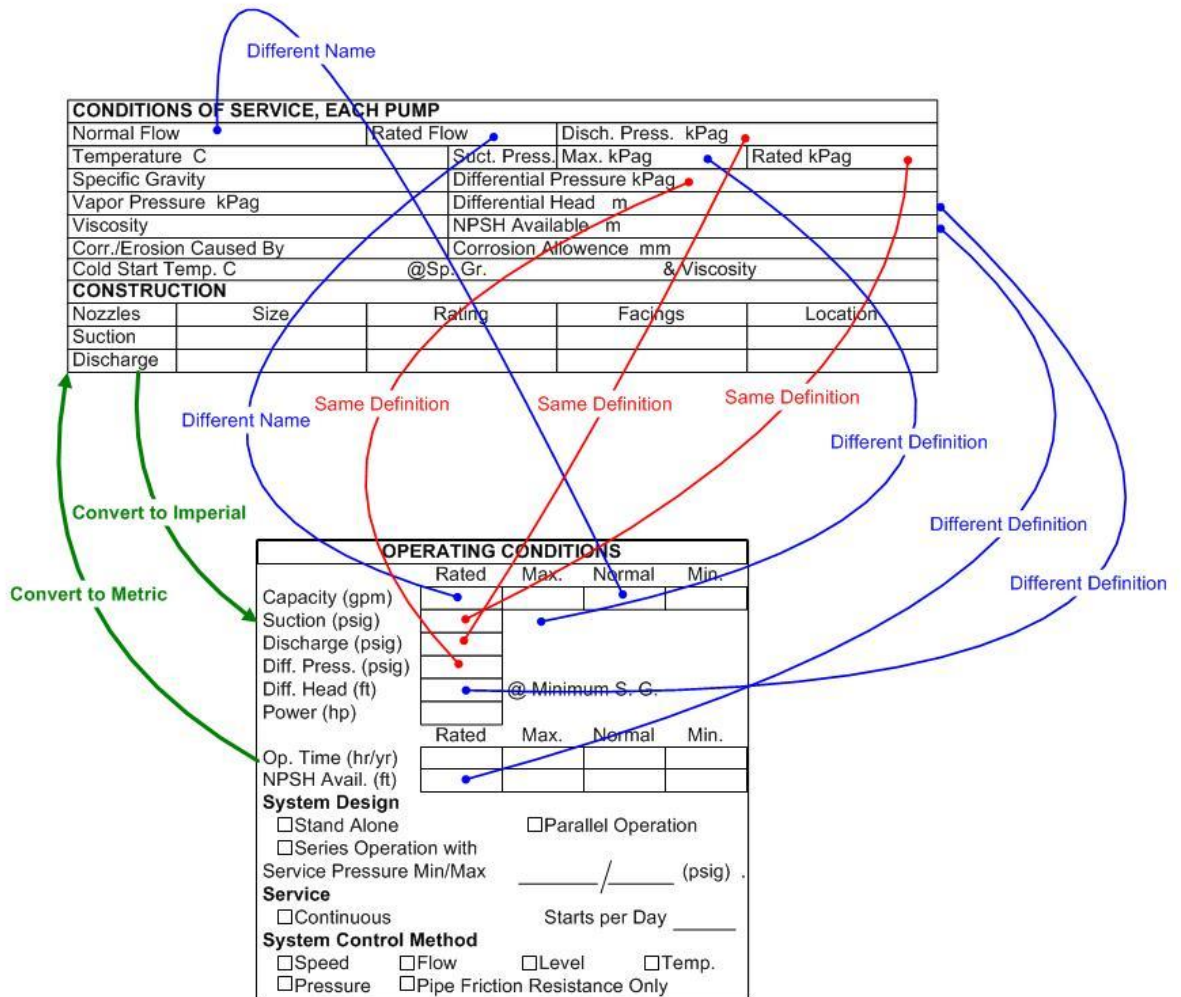
Figure 1: Compare Two Data sheets

The most notable difference is that one data sheet expects Metric units, the other Imperial. But beyond that, the data sheets are organized differently--the data are grouped differently, and

the groups are arranged differently. These two excerpts only have eight data spots in common. But looking closer, of the eight spots, only three are obviously identical:

| Discharge Pressure |
| Rated Suction Pressure |
| Differential Pressure |

The rest require some interpretation:

Metric Data sheet	Imperial Data sheet	Comments
Normal Flow	Capacity: Normal	Probably the same
Rated Flow	Capacity: Rated	Probably the same
Max. kPag	Suction: Max.	No data entry spot
Differential Head	Diff. Head: Rated	Possibly the same
NPSH Available	NPSH Avail.: Rated	Possibly the same

The Challenge

When we exchange information without context we make it difficult for others to understand what we mean.
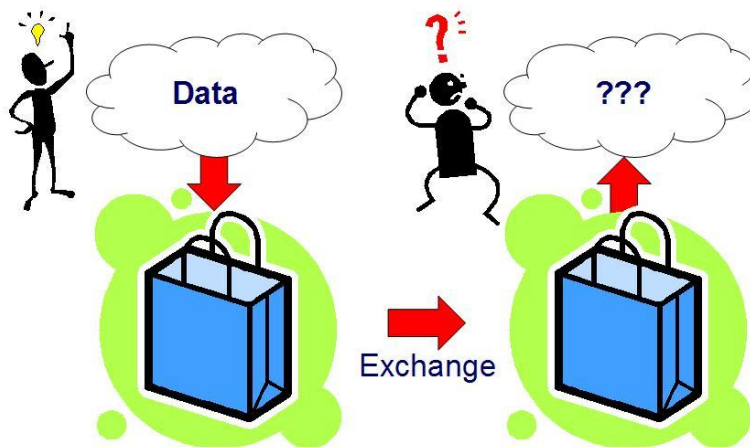
Figure 2 - Putting Information in a Bag

Figure 2 starts with someone having a bright idea. To achieve some business result he has to pass the information to someone else. If he just sends the information without context, he is just throwing it all in a bag, hoping the person on the other end can figure it out.

The reason information exchange worked in the past was that we exchanged entire sets of data (for instance, a complete data sheet) where the context was preserved. But the disadvantage is precisely that: we have to exchange whole sets of data and have humans interpret them item-by-item. What we really want is to be able to let machines exchange information directly without having to rely on context to retain meaning.

Why Can't we Just Cut and Paste?

What we really need is a "cut and paste" tool for plant information. We want to be able to just "cut it from that data base over there" and "paste it to this data base over here". But it's not that simple.

The first and most obvious reason we can't just use a simple Cut and Paste tool is because the data values we want to transfer seldom map to the same (x,y) coordinates on any two data

sheets. In order to know which data values to transfer we have to first know enough about the data sheets and underlaying databases to know which values are involved.

The second reason we can't just use a simple Cut and Paste tool is that mathematical transformations are sometimes required, such as conversion between Metric units and Imperial, as in the data sheet example above. The third reason is that engineering judgment is often required. All of these actions are trivial if you have the right context. We have many thousands of design engineers doing this all day, every day, and generally, they are good at it. But we rely so much on context to convey meaning that we cannot trust machines to make the right decisions on their own.

Using ISO 15926 to exchange information means you no longer have to know anything about your information exchange partner.
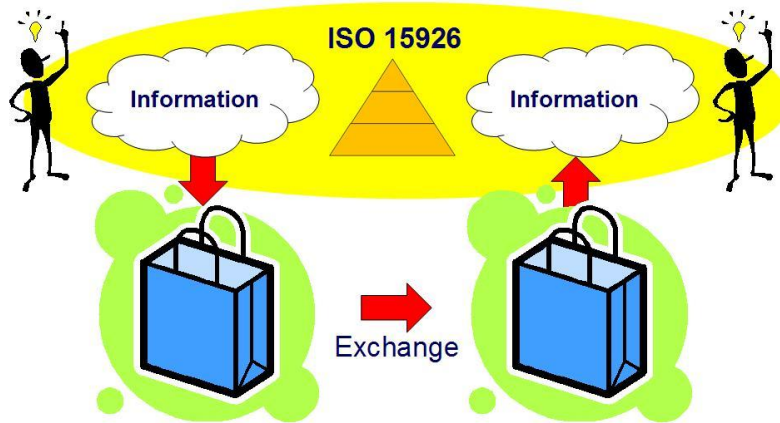
Figure 3 - Putting Information in an ISO 15926 Bag

When we encode information in ISO 15926 format, we include enough context that other ISO 15926-enabled tools will clearly understand what we mean.

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