White Paper
November 2014

Streamline and Automate your IMP

SUNNET SOLUTIONS™ "Doing IT Right"™

SunNet myDataIQ

Pipeline Computer History - 101

Computers and all they can do for us; what more can be said that hasn't? It was not too many decades ago when a whole room would be designed and dedicated to just one computer system. These earlier systems required a lot of room and needed a cooling system that would prevent the computers from overheating. Now the same capabilities of these earlier computers are provided in computers that are hand-held, and are capable of doing much more than their early predecessors. It seems that almost all we do today, there is a computer involved, and in some cases through initial design computers are actually needed. For example, should the computer fail, would be very difficult, probably *even impossible* to pilot some of the newer fighter aircraft in use today by the armed forces.

"I think there is a world market for maybe five computers." – A quote from Thomas Watson, Chairman of IBM in 1943. Who would have thought that computers would become such an intricate part of our everyday lives, much less operating a pipeline system? *"There is no reason for any individual to have a computer in his home..."* – a quote from Ken Olson, President, Chairman and founder of Digital Equipment Corporation (DEC), during a talk given in 1977 World Future Society meeting in Boston. Now laptops, Ipads and even cell phones are used in our vehicles, or hotel rooms to monitor a pipeline's operating status and make changes if necessary.

Today computers have made such pipeline processes as engineering, design, operations and even maintenance much quicker and much more efficient. The computer's first real in-roads to the pipeline industry came as a need in both engineering and design, but today some pipeline systems are actually controlled, monitored and operated, for the most part by computers. It is safe to say, and a lot of people would agree that most of what we do today so effortlessly may have been very difficult to achieve before the inroads of the computers.

Computer Uses Today

Let us briefly consider some of the needs of the computer today that were not even thought of in the pipeline industry's early history. The *computational pipeline monitoring* (CPM) systems, for example can be found in use today in almost all pipeline systems in some aspect or another. Some of these CPM systems seem simple by today's standards, but they were basically designed and installed to better detect and alarm the operators of leaks, should any occur, allowing them to more quickly get a situation under control. These systems were earlier designed to do little more than monitor the pipeline's input and output pressure, temperature and flow rates, and in some cases should it detect any difference it would alarm the operator to

its detection, but these have since gotten much more sophisticated over time and now play a much bigger role in the scheme of things.

Probably developed as a result of the CPM, or just perhaps as a natural progression of things, the pipeline owners and operators have raised the bar, *or up the ante as it were*, by installing *supervisory control and data acquisition* (SCADA) systems. Now with the ever developing use of the computer, several pipeline systems can virtually be monitored and control from one central remote location. And of course as the computers become more lean and productive, so do the peripherals and programming needed, or associated with these computers.

Typical Present Day Pipeline Control Room

As these computer systems and their needs have grown, so has their uses. By doing what is expected of various computer systems, and their programs, a lot of data is acquired and stored as a result. Early on, the primary reason for this data collection and storage was merely due to the fact that the computer programs needed it to make certain decisions, react automatically to alarms or to maintain control within the pipeline's designed parameters. It was also quickly realized that the data collected and stored by the computers could be very useful in answering certain questions that may arise from a particular time during the pipeline's past operation, such as during an emergency, or during some abnormal operating situation, and used in such a way to ensure that there were no reoccurrences. It now has become a normal mode of operation to query a systems database from *time-to-time* to answer many questions, or maybe just to simply satisfy one's own curiosity as to how well a recent alteration to the pipeline system is performing.

Database Access

The pipeline industry is in a mode of sorts, now where there exists for each pipeline system several different computer systems and programs, all managing and having their own separate databases. As the needs change through design and/or regulations we have become more aware of the need and conveniences of accessing all these databases to accommodate the many changes in operations, design and other facets of owning a pipeline. In the past, when fewer programs were used, it had not been too much of a problem to have a separate database for each program, because of information, wherever needed, one would just go to that particular program, access whatever that database had available, and go on to the next database if more information were thought to be needed, and hoped to be available. It is quickly becoming the norm that more than one database access for information is needed to satisfy a particular issue or situation, and because the databases were originally designed to merely satisfy a particular program's needs, sometimes not all data retrieved from multiple databases seems to merge well together in a real meaningful manner. This is where a program such as Sunnet Solution's myDat@IQ$_{TM}$ begins its introduction into the history of computers and computer programming.

Sunnet Solution's myDat@IQ$_{TM}$

SunNet Solutions is a web application development and information technology provider with a over 12 years of commitment to serve their clients with IT solutions. They provide a full range of services in the areas of software development, enterprise software solutions, database application and web portal development. From small businesses to large corporations, they provide affordable IT solutions that will maximize efficiency and increase profit through optimum web-based applications. .myDat@IQ$_{TM}$ database manager is just one of many programs Sunnet Solutions has to offers. It is a multifaceted and unique database manager that begins with a foundation program that can be customize and added to any customer's needs, and although it is not the only database management program available, it is certainly thought to be one of a kind. Even though its programming core begins as what appears to be just another database management program, myDat@IQ$_{TM}$ does much more than just store and retrieve data, and remember what it has done with it. This program is designed to manage multiple databases, leaving them, and their data content virtually unchanged, or if desired can copy and merge all, or some information of all databases together into one main database. This database management program can be built to accept any, and all forms of data; handwritten, photographs, drawings, quantitative values, etc. myDat@IQ$_{TM}$ has the ability to not only access and retrieve data from other databases, it can also be programed to evaluate the data as it receives it, and ensures that it understands all it needs to know, in order to store it properly (*again, through its initial programming*), and will even check against all other similar

data that already exists – *no matter where that data is located*. If while data is being entered appears to be a duplication that already exist, or does not merge well with what is already available, myDat@IQ$_{TM}$ will prompt the computer program operator to check it, and make any necessary alterations to ensure the data is good, and is stored properly. As it should be, for historical purposes this database manager will not over-write any data.

The Many Uses Of myDat@IQ$_{TM}$

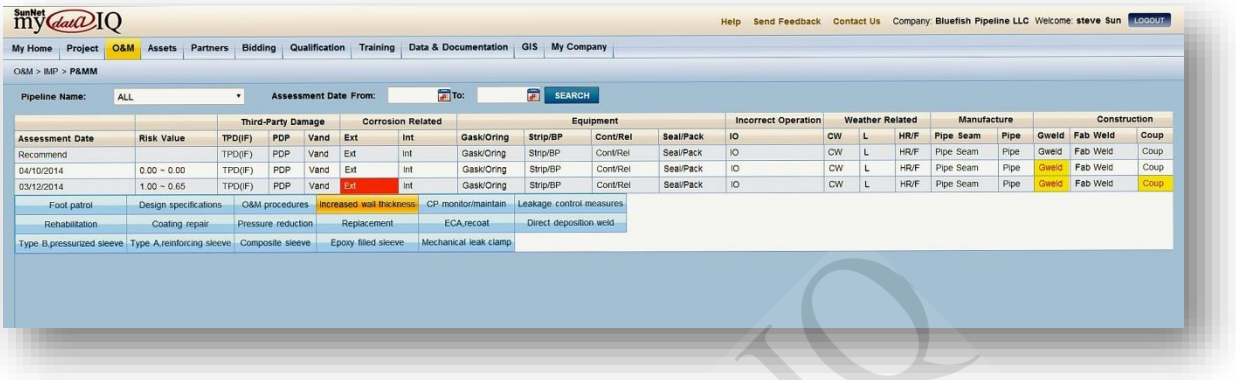
Most of this discussion will be centered on an integrity management program (IMP), and how well myDat@IQ$_{TM}$ assists in improving the performance of any IMP and its end results, but myDat@IQ$_{TM}$ has much more to offer in other areas such as project management, operator qualification, public awareness, accounting, etc.

Most pipeline operators' IMP, *just in their nature*, are massive database user, and should be. This is where myDat@IQ$_{TM}$ will really shine. As we all know one requirement for a good IMP to perform properly, with good results is having all available information quickly within an operator's reach. The IMP regulations have been in place now for many years, and because of this, the pipeline operator has amassed tons of data and employs many databases full of good and useful data. Within these pre-existing databases, there lies some very good information. Some data that probably has been available for years and simply forgotten, but just the same, provides very important information for so many processes within the IMP that are needed and required. Any good IMP needs to be ever-aware of all historical data, no matter how insignificant it may seem at the time it was first entered, and should be data considered during all phases, or implementation of the many IMP processes. As is the nature of program databases, all data collected and stored, *no matter the collection process or format used*, is associated with a particular pipeline system, or a segment of that system. myDat@IQ$_{TM}$ can be programmed to understand these and many more associations by knowing just where to find data when needed – again, no matter how insignificant that data may have seemed initially. This database manager does not discriminate when considering available data, if data is available for whatever reason; myDat@IQ$_{TM}$ will bring it to the forefront offering it up as a possible consideration, no matter IMP process is being implemented.

IMP Management

For the benefit of this IMP management discussion we will use a mock project call the "*Recoat Project*" performed sometime in the past, and let's say this project took place some 14 years earlier on a 30 year old pipeline system. We will use this mock project, and this data as a single maintenance incident that we will carry throughout some examples of how myDat@IQ$_{TM}$ works, in an effort to explain and highlight the many program features, expectations and uses. Also, In doing this it is hoped that the reader will better understand how important one item

from some otherwise seemingly obscured historical data can be used over, and over again as a very useful means for something as involved and massive as a good IMP, and give some insight into how myDat@IQ$_{TM}$ actually works, and also highlight some of the features that it has to offer.



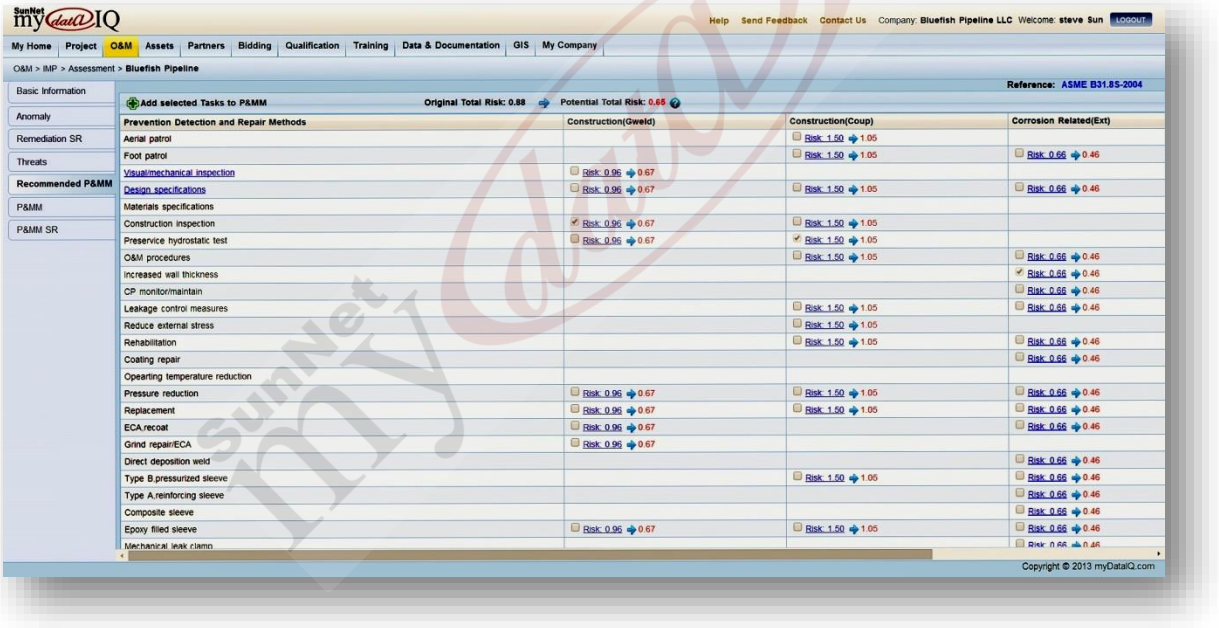
A good example of how myDat@IQ$_{TM}$ will work within many aspects of operating a pipeline, just by being always available, and waiting for the go-ahead to run. Let's take the following common example, myDat@IQ$_{TM}$ has in its database (*in this case, available from a historical maintenance record*) records of a 1,500 feet segment of pipeline recoated, and its cathodic protection (CP) system's protective current output was reduced as a result, some 14 years earlier. As mentioned in the preceding paragraph, let's call this example the "*Recoat Project*" for this, and following discussions. A good maintenance record was developed of the *Recoat Project* and served as a very good piece of historical data to have for various reasons at the time it was recorded, and now while trying to determine threats for this pipeline during an IMP risk analysis process, it becomes even more important and becomes a consideration to myDat@IQ$_{TM}$ rather than just a maintenance record. myDat@IQ$_{TM}$ is aware that this information is available, because that is its nature, and will always consider it during any process it is asked to perform.

Recoat Project

It is the job of myDat@IQ$_{TM}$ through its programming to be aware of this data through continued awareness and recognition that a lot of good information exists from many records for various reasons. One of the items that myDat@IQ$_{TM}$ considers and would find noteworthy and possibly important as future reference, is the *Recoat Project* did not include any pipe replacement or repairs since the external wall loss was found to be minor, leaving more than enough wall thickness to continue operating the pipeline safely. But the wall loss did cover a large area as general corrosion, so the *Recoat Project* was quite an undertaking. It was also noted in this particular maintenance report that the root-cause was poor coating leaving too much of the pipe's exterior exposed to corrosive elements, and no other threat contribution was correctly noted. The CP system was in play, but was being operated at a level that may have soon caused later more serious corrosion problems with all of the pipeline's coating system failing in that general area had it gone unchecked. Before the coating repair the records also indicate that even with the CP system's protective current at an elevated level, the *pipe-to-soil* potential readings were still not what was needed or required to protect the pipeline's exposed surfaces. When completed the *Recoat Project* was a success, in that the CP system's protective current could be reduced after follow-up investigations were performed. All of the good work and good record keeping was probably initially recorded for prosperity, and thought to be nothing more than simply a matter of historical information. Now some 14 years later myDat@IQ$_{TM}$ has access to this information and will use it as consideration for as many processes it is programed to initiate.

Risk Analysis

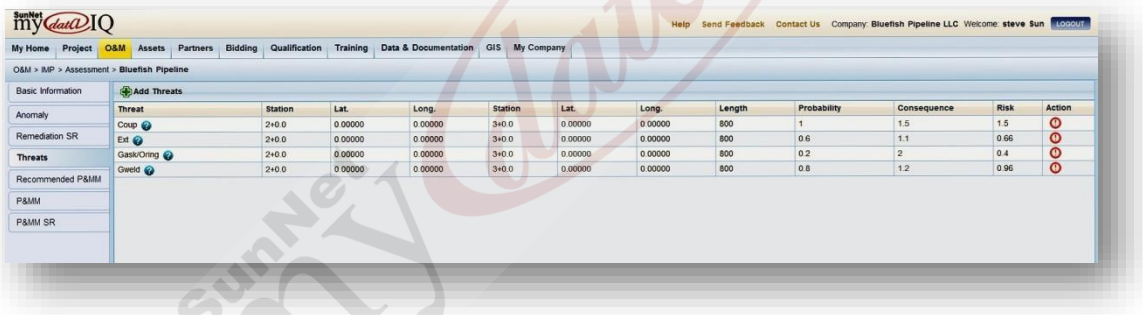
A risk analysis is now required for this previously mentioned pipeline system having the benefit of the *Recoat Project* preformed 14 years earlier. Would the *Recoat Project* reports be an important consideration for this risk analysis process, and would the operator need to consider them? Well, in reality this would not matter if **myDat@IQ**TM is employed to assist the risk analysis program in making its determinations. **myDat@IQ**TM will always be aware these records exists, and will bring them and others like them to the forefront for consideration, no matter what task or process is being performed. Once the risk analysis program is made aware of these records, including the relative details that **myDat@IQ**TM has extracted, the risk analysis results will be much more exact; a threat that may have gone unnoticed is now elevated to its proper level of consideration. After all, if a pipeline coating has already failed in one area, one should consider the possibility that failure could exist elsewhere, and should be thought of as a valid mechanical integrity threat. **myDat@IQ**TM will make this, *possibly forgotten* information relevant, because that is what it does.



Integrity Assessment Method and Remediation

The *Recoat Project* again comes into play while trying to determine an integrity assessment method and making determination for all possible remediation considerations. Thanks largely to the work of myDat@IQTM during the risk analysis process; we now know external corrosion, due to coating deterioration is a real threat consideration. Because of a history of wall loss due to poor coating, the decision is made to use an inline inspection (ILI) tool as the method for

integrity assessment. As the results of the tool run are analyzed the data is then imported by myDat@IQ$_{TM}$ into its database for storage, retrieval and further analysis. While myDat@IQ$_{TM}$ considers the anomalies and begins to prepare the dig sheets for remediation as required by the appropriate regulations. It should be noted that myDat@IQ$_{TM}$ is aware of where the high consequence areas (HCA) are and uses this to correctly prioritize the digs and repairs. To continue with our *Recoat Project* example, let's say there are a total of 550 anomalies in need of attention, and are grouped in 27 general areas, with only 15 of these found within HCA. myDat@IQ$_{TM}$ has not forgotten about the historical *Recoat Project* record, and realizes that 5 of the areas noted, because of their location are called out as areas of concern and are included as anomalies in need of repair. This recognition is added to its report, and suggests that these may have already been taken care of some 14 years earlier by the *Recoat Project* – remember no repairs or pipe replacement had occurred to restore any wall loss, so these could be the very same anomalies found at that earlier time. As it turns out the *Recoat Project's* new coating was still in very good shape as verified by a few pipeline exposures, and the wall loss depths that were called out by the ILI tool were, indeed preexisting, and with that bit of information, more time and effort would be better spent on the remaining 10 areas, of which were really of lesser consequence in this particular case.



Preventative and Mitigative Measures (P&MM)

Remediation is complete and a reassessment of risk is again performed. The overall risk value for the pipeline system has been reduced, and because not all of the existing coating was replaced of course, it is now time to use myDat@IQ$_{TM}$ to determine any P&M measure that may be appropriate to reduce the risk value even more. By accessing information from its database and any others available to it, myDat@IQ$_{TM}$ is able to offer up possible P&M measures that are available, and will even offer an opportunity to provide possible effects each proposed measure would have on the risk value should they be chosen to implement. If it has in its programming, and has access to necessary financial information, it can also provide an estimate for cost and any risk reduction realized for any possible P&MM considered. After the P&MMare

implemented, myDat@IQ™ will simply ask if a risk analysis is wanted, or based on its programing, would just provide the current risk value and can also provide new threat prioritization, as well.

Program Self Evaluation

Because myDat@IQ™ has all that is needed to perform, or implement a very large and demonstrative IMP, it also has every capability and available data for evaluating how well all processes have performed, and produce records and demonstrations in any format a pipeline operator could think of to prove or show ongoing progress and any cost savings. And if IMP personnel are at a moment's loss for a demonstration, myDat@IQ™ can, *of course* offer up suggestions – at this point would you expect less?

Today's computers have become great tools for doing almost everything, and in using the best available programs just make the computers even better tools, and even more of a necessity. Hopefully this writing has given some insight into how all of this is possible. The many capabilities of myDat@IQ™ have only been touched-on here for introduction purposes, *with the surface only scratched*, but it is hoped this has instilled enough interest and consideration to promote the use of this innovative and very powerful database management program.

By Randy Vaughn, SunNet's Pipeline Database Management Solutions Advisor