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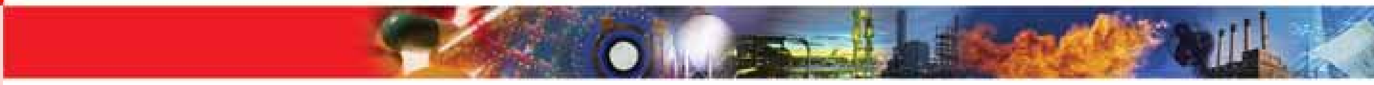

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Technical Paper

The Seven Deadly Sins of Process Analyzer Applications

Randy Hauer
AMETEK Process Instruments, USA

Zaheer Juddy
Analytical Instrumentation & Maintenance Systems (AIMS), UAE

Yasuhiro Yoshikane
Umbersoll, Japan

John Sames
Sulphur Experts International, Barbados

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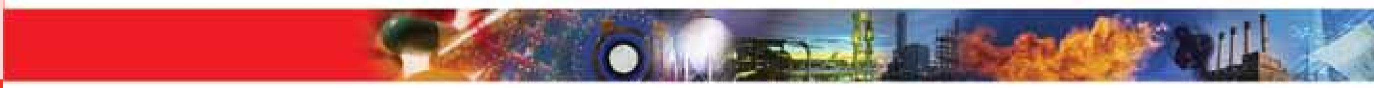

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Randy Hauer
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Abstract

On-line process gas analyzers comprise a relatively small proportion of the capital investment in a grass roots project but they require detailed attention if they are to be successfully implemented and fully exploited. The chain is long and the mistakes are many. It runs from front end engineering design, to EPC detailed design, through systems integration, selection of technique and vendor, factory acceptance test, start up, handover and a life cycle support strategy.

The paper follows a theme made popular in previous papers on *The Seven Deadly Sins of Sulfur Recovery*, and *The Seven Deadly Sins of Amine Treating*. The intent is to offer examples as well as quantitative information based on historical experience of analyzer engineering and sample handling details. The subject is one of the least understood facets of a project, the profession is occupied by people from various fields who have made it their life's work and this is a collection of their findings.

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1) Introduction

The objective of this paper is to give an audience of primarily process design engineers a detailed view of the problem areas relating to a typical slate of process analyzers found in a large grass roots project. The examples are mostly related to gas processing, and sulfur recovery unit operations familiar to this group.

There are many specialty sub-suppliers to the sulfur recovery and gas processing industry and many of them display and present materials at conferences such as SOGAT. These companies include the engineering firms who license the proprietary processes, catalyst and solvent vendors, mechanical devices, specialty instrumentation suppliers, and process testers and problem solvers. The experts from these various companies make it their life's work to gather expertise in a core area and they are valued for their experience.

The process analyzer business can certainly be characterized in this way. No one graduates as an analyzer engineer, it is a profession populated by chemical, electrical, instrumentation and mechanical engineers. It is supplemented by various branches of science such as physicists, chemists and spectroscopists who have migrated from research to the applied end of their profession.

To provide the widest possible view and to generate debate the four authors are specifically from distinct aspects of the process analyzer industry. There is not always agreement as to where the root cause of an analyzer problem lies but there is consensus on the leading problem areas, their general remedies and this short list of "seven sins".

The four aspects of the analyzer industry represented in this paper are:

- The process analyzer vendor, supplier of discreet devices ranging from the simple (pH, oxygen) to the more complex (gas chromatographs, UV photometric, tail gas and ultra-low concentration moisture analyzers).

- The systems integrator ("SI") contractor; responsible for the combined package of sample transport, sample conditioning, analyzer device, validation, utilities, shelter, HVAC, and communications.

- The contract maintenance provider, responsible for lifetime support of the total system provided by the systems integrator.

- The independent performance testing contractor. Given the reactivity and toxicity of sulfur recovery process gases on-site lab results are considered the reference method for H_2S / SO_2 tail gas and related analyzer applications. In many cases systemic analyzer problems are not discovered until this test is complete.

It is difficult to have a perspective of the process analytical industry from the vantage of any one company or enterprise or even for the combined experience described above. In this regard it was fortunate to have access to a recent paper as well as a panel discussion from four highly regarded analytical professionals taking a self-critical look at our industry. These two sources (the four resource companies and the technical review paper) were invaluable for describing trends and to point out the challenges as well as some of the self-inflicted sins of our own profession.

This collection of *sins* is not intended to present a scolding of the FEED, EPC, end-user or the hydrocarbon processing industry in general. To be sure, some of these *sins* are reflections of where the vendor or integrator has failed. The intent is to draw attention to areas where excessive costs are entailed, analyzers fail to meet their expectations, processes are not fully optimized and the full benefit of the analyzers are never realized due to a negative or legacy reputation.

2) Overview of the Process Analyzer Industry

It is worthwhile for the process engineering audience to have an idea of the breadth, scope and size of the process analyzer industry. The overall market size as well as the spend on an individual project is relatively small as compared to total project costs but the impact far outweighs the cost. Process analyzers are always a fashionable topic.

2.1) The Big Picture:

- The global cumulative value of process control enterprise is USD 409 billion 2009-2012 or ~USD 136 billion/year; the market is viewed as being flat in this period.
- Process Analytical Instrumentation (PAI) comprises only 6% of this amount, (~USD 8 billion/year). This is a relatively small portion of the total spent on process control but it draws a great deal of attention in the control world.
- The market figures are based on all industries and by far the chemical process industries (CPI) dominate, accounting for ~70% of all process analyzer applications with utilities and pharmaceutical sharing the balance.
- Considering only the CPI portion USD 2.85 billion is spent on maintenance, USD 1.75 billion on analyzers, USD 560 million on systems integration and USD 450 million on sample handling systems per annum.[1]

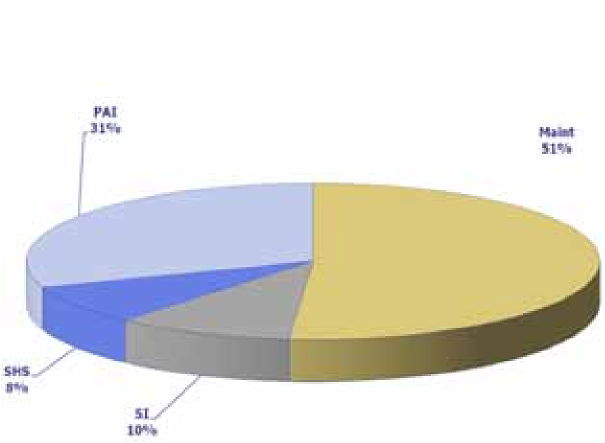

Fig. 1. Process Analytical Spending by Category

2.2) The Project Picture:

- According to a major international oil company, integration represents 55% and analyzers 45% of the total cost of an analyzer project. This somewhat contradicts the overall industry figures but can be explained by the fact the CPI spend more on shelters, no doubt influenced by hazardous area (explosion proof) design.
- The Systems Integrator breaks the spending down as; Analyzers: 30-40%, Shelter and Sample System (with commissioning spares and consumable gases): 40-50%, Fabrication Labour: 8-10%, Engineering/Design: 8-10%, Crating & Misc: 2-5%
- The 15-year cost of ownership of an analyzer system is equal to the total capital cost of the fully integrated system. Half of this cost is labor, the other half is parts. Of the half invested in parts, ~25% is consumables and ~75% replacement parts.[2]
- Shelter costs for chromatographs are on-par with the cost of the GC. For example an analyzer house for eight GCs costs more than the eight GCs. This is the rationale for locating several analyzers in one shelter, which at times is a source of problem in itself.

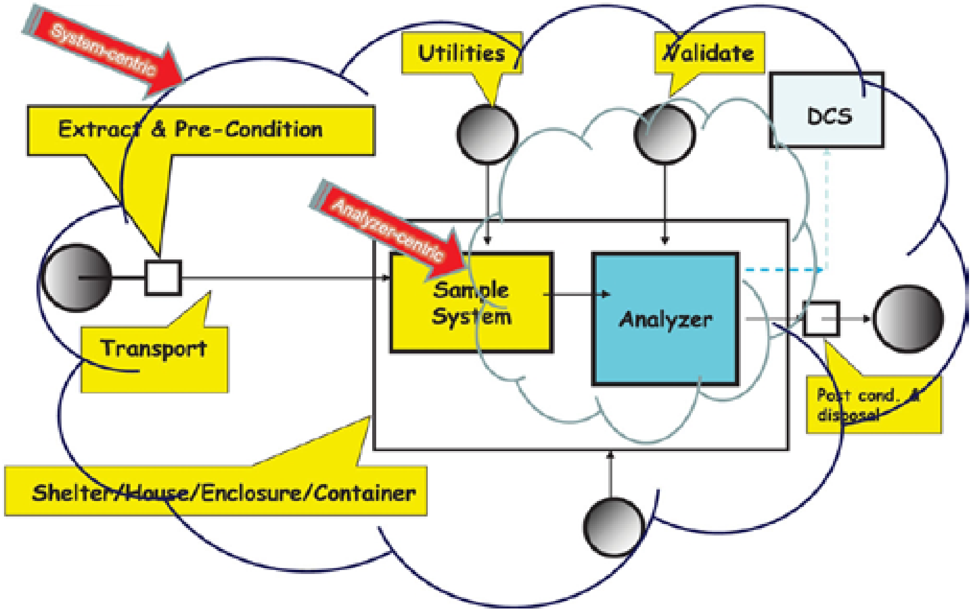

Fig. 2. Analyzer System Scope of Supply (Courtesy of Rob Dubois, "*by-line analytical*")

2.3) Trends in the Process Analyzer Industry:

The industry is characterized by widely diverging attributes. It is generally conservative about adopting new technologies, if it works, repeat, repeat, repeat. [1] On the other hand there are significant advances in analytical technology that are game changers in themselves. How quickly they are implemented varies but here are some general trends;

- Competition amongst analyzer vendors has encouraged technology advances, led to improved performance and constrained cost increases.
- There is a revolution in spectroscopy with multi-component measurement capability competing with GCs.[2]

- Analyzers that are close-coupled to the process (“by-line”) requiring very little integration are becoming common. Size and weight matter.
- The “New Sample System Initiative” (NeSSI) allowing for smart sample systems, smaller footprint has gained a modest market acceptance.[1]

2.4) Generalizations:

- The process analyzer industry is largely fragmented and there are many specialist suppliers. There are a few large companies that can supply something in the order of 60% of the applications, some of those with compromise and never all the tags.
- It is hard to buy a bad analyzer, as long as it is properly specified for the stream conditions. It is hard to buy a bad analyzer system, as long as project teams incorporate the design requirements necessary to make the systems work.
- The price of the shelter and HVAC now dominate the price of the analyzer system. It is uneconomical to supply a shelter for only 1 or 2 analyzers.
- One third of all analyzer systems are over-designed; one third is under-designed; perhaps one third is adequate.
- Sample systems are not optimized for the analytical technology or process application. Many sample system components are still not “fit for purpose.[3]
- It is difficult and expensive to design analytical systems to meet multi-national hazardous area requirements, global harmonization would be welcome.
- Most process analyzers are not required for process control but are used for process automation.
- The full capability and features of a process analyzer are rarely utilized, for example; over-range measurement, COS and CS_2 in tail gas, COS in TGTU absorber off-gas, combustibles in fired heaters (with O_2 measurement) as well as ethernet and web-enabled communications which have safety benefits.

3) The Seven Deadly Sins of Process Analyzer Applications

3.1) Lack of Knowledgeable Analyzer Engineers at the FEED and EPC Stages

A problem in the process analyzer industry is the amount of time it takes to acquire an adequate engineering skill set to be able to address the wide variety of disciplines involved in a typical project. The majority of the qualified analyzer engineers are employed at the systems integration level and relatively few at the EPC and practically none at the front end engineering design (FEED) level. Some examples of how this impacts a project;

- From the perspective of the system integrator, a key point is that all drawings and documentation have to be approved by EPC engineers. It can at times be beyond their capability and the SI vendor needs to get these items in place at site. In addition it becomes very difficult to manage the analyzer scope because many of the tie-in points fall into other disciplines, many types of engineering are required at the EPC level and not all of them are familiar with analyzers.
- Instrument data sheets that are out of date: It is not uncommon to see instrument data sheets that are dated 10 years or more with only minor revisions in between. The result is typically a change order at the detailed engineering phase by the system integrator

and in fact many SIs recognize this at the quote stage but prefer to take advantage of it in post order.

- No provision for recent advances in the field of process analytics. Related to the above, the temptation to define a measurement using a single analytical principle, Gas Chromatography being an example. The process GC is quite simply over applied as a default especially when a GC vendor is doing the SI.
- It is accepted in the industry that competition amongst analyzer vendors has encouraged technology advances, led to improved performance and cost improvements.[2] New technologies with a proven track record still get passed over because it was not used in the last project ten years prior. In defense of the above, the analyzer industry does not provide sufficient information to evaluate the performance of different technologies for different applications.[2]
- Relative to spending on DCS and discrete devices there are proportionally many more instrument and DCS engineers than analyzer engineers at the EPC level.
- Critical evaluation of sample system design for specific applications is lacking. Most sample systems are designed based on duplicating previous projects with new features added haphazardly.[3]

The Cost:

- Savings of 10-30% depending on shelter requirements and technology.

The Remedy:

- A detailed review of all analyzer tags by the end-user and rationalization at the FEED stage that the technology and method have been updated.
- Retain, nurture and organically grow a cadre of analyzer engineers.
- Failing that, retain independent analyzer project consultants to review the technology and look at improvements.

3.2) Piping Engineering, Major Mistakes Designed In at the FEED and EPC Stages

If analyzer engineers had to pick one single problem area that is universal it would be piping design. It is not so much that mistakes are made, it is that they are most always impossible to correct or remedy after the fact. Piping design is done well in advance and most often construction completed by the time an analyzer specialist recognizes a problem. Not to trivialize the issue but every AIT (Analyzer-Indicator-Transmitter) looks the same to a piping engineer when in reality a pH measurement is quite different from a close-coupled “by-line” analyzer, is different from a gas chromatograph in a house.

A list of problem areas;

- Process piping design is not optimized for analyzer system installation. Standardized sample tap designs have not been developed for analyzers in a similar fashion as standard designs for temperature, pressure, flow and level transmitters.
- Although the proper location of analyzer sample taps on process piping is generally understood, standardized practices for selecting these locations are not widely published or used.
- Access to analyzer sample taps is usually problematic.

- And the question remains, how do we establish standard practices and design specifications for process analyzers so that they are implemented properly by process instrumentation and piping designers?[2]

Fig. 3. Example of Accessing a Difficult Tail Gas Analyzer Sample Point.

The Cost:

- Mostly minor. The price paid is usually in terms of a compromised location that has to be lived with for the life cycle of the analyzer, possible HS&E implications.

The Remedy:

- Review by an experienced analyzer engineer at the early stages of the FEED and then again at the detailed engineering phase.
- Bring in specific vendors to solicit their views and list of best practices.

3.3) Award of the Systems Integration Contract, Compromises at an Early Stage

It is the opinion of the authors that a great deal more of the basic and detailed design decisions are left to the responsibility of the analyzer system integrator than with any other technical component in a project. The main reason is there are insufficient analyzer engineering resources at the FEED and EPC level to exercise full oversight.

As noted elsewhere in this paper, many large gas processing and olefins projects are GC centric and for that reason only the major GC manufacturers are able to competitively bid. *If the only tool you have is a hammer then everything looks like a nail.*

Nearly all analyzer projects are lump-sum fixed-price and are the general rule in the industry. Margins have been tightened and there are more vendors chasing fewer dollars.[6] It is an environment where:

- The Systems Integrator looks to supplement their revenue stream in the form of change orders, extending the hand over period or facilitating a maintenance contract for long term maintenance.
- The reluctance of the systems integrator to purchase specialized sample handling from the analyzer vendor. A recent example in the Gulf region where the SI was adamant to supply their own heat traced lines for SRU tail gas. Their lines were not capable of the 155° C heat duty for SRU tail gas and plugged. The SI prevaricated for eight weeks, left the site and it took six weeks to get the correct lines installed. The Superclaus® SRU was without a tail gas analyzer for 14 weeks and the SI was out of pocket for the correct sample lines.
- It is an obvious economic and sales driven decision for the systems integrator to try and increase the portion of SI work as cost adders to their project (vs. value added by the analyzer vendor) once they commence.
- Competition among SIs on integration work is very keen and with lower margins.[6] The industry trend is to make the design of the sampling system, HVAC and communication systems complex to increase the balance of "manufactured" items within the integration portion. The result is then to overkill the sampling system and over-design certain portions to "grow" the margins.
- When the EPC is awarded and the budget gone the EPC team sacrifices good analyzers for an oversized HVAC. There have been many situations of the SI buying cheap analyzers, poorly installed but delivered in shelters with +/- 1 °C ambient, 60 to 70 % RH which is triple costs vs. a +/- 2 °C, 50 to 80 % RH.
- Also, typically the GC vendor is part of a large field instrumentation group and they have conflicting communications protocols. If field instruments are chosen with X protocol it has a direct influence on the selection of the GC vendor. Hence the SI may not provide the best specific analyzers since they need to communicate through a protocol (closed architecture) instead of some minor work required to do the gateway to a standard open protocol. The analyzer selection process then becomes a victim of the sales strategy from the instrumentation vendor. The situation has to be lived with it but sometimes creates issues that are pushing to select the wrong or inappropriate analyzer. Commercial considerations pushes the selection of specific closed protocols while the analyzer world outside of GC calls for a generic protocol much better served by niche market suppliers.
- The reluctance of the systems integrator to retain the analyzer vendor for start up and training of end user personnel and check the analyzer has been properly done.

The Cost:

- Sometimes significant, 20% or more of the contract in terms of change orders.
- Sometimes benign, an example being an SI who inserts themselves deeply into the project with a no bid perpetual maintenance contract in mind.
- A USD 12 million analyzer project that requires significant changes after handover

The Remedy:

- Independent advice from outside resources or fully qualified analyzer engineers on staff to oversee SI contracts from start to finish.
- Be ready for handover when the SI is completed their punch list.
- Always retain the analyzer vendor for start up of the more complex (category 8-15, Table 1), the SI will always recommend against this and they should always be corrected.

Start up by the vendor is invaluable; they check for mistakes, they ensure warranty validity and can properly train the end user technicians.

3.4) Lack of a Comprehensive Plan to Staff for Start-up, Training and Maintenance

The most critical time in the life of a process analyzer is start-up. It is not logged or otherwise measured but the confidence level in an analyzer is determined by the operators and they are the final judge. If the first weeks and months go poorly the road back is long and hard. It has been our direct experience that ~30% of all tail gas analyzers are not placed in closed loop control, maybe fully functioning but not in cascade control. The major reason is lack of trust in (reliability of) the measurement.

The analyzer industry is short-handed at all levels, the lack of experienced analyzer engineers has been noted and the major reason is there is no specific academic path. Professionals are barely at the journeyman level after ten years' experience. At the craft level it is a universal problem to adequately staff for the number of analyzer tags in a complex. Part of the problem is overwork of the existing staff discourages newcomers; there is no acknowledgement of the unique skill-set required nor is there adequate training.

Add to this, the step changes due to new technology opportunities step changes now being driven in maintenance and technical support.[2]

- How to deal with skills' shortage? Maintenance of current process analyzer technology has been identified as an issue for many years but little has been done to alleviate the problem.
- Maintenance continues as the largest expense component of the life-cycle cost equation. Understaffed maintenance organizations are looking outside process analytical industry and SI organizations to contract maintenance providers for help.
- PAI products will continue to incorporate advanced (remote) diagnostic functionality.[1] Inversely related to this is the surprising fact most tail gas analyzers are not connected to the digital communication network as almost all other analyzers are. Given the safety aspects and critical process need for this analyzer, it is a requirement.[6]
- Current process analytical technology is becoming increasing difficult to maintain due to the high level of training required and lack of highly skilled personnel. Dedicated process analyzer training programs are needed.

Following are the metrics used by a major oil company based on a three year statistical study of over 10 refinery, oil & gas and sulfur recovery plant complexes.[7]

Complexity Factor	Type of Analyzer	Estimated Man-hours/month Maintenance
1~5 (Simple)	pH, conductivity, gas detection, O_2	2
6~8 (Physical Property)	Boiling point, flash point, freeze point, RVP, viscosity, etc	3
9 (Environmental)	CEMs SO_2, CO, H_2S, Opacity,	2.5
10~15 (Complex)	Tail gas, GC, Mass Spec, NIR, FTIR	4

Table 1. Grouping of Analyzer Categories for Maintenance Purposes

The users derive the following lessons and rationalize their staffing levels based on;

- As previously noted not all analyzers are the same. For this study they are scaled 1-15 in complexity. Categories 1-7 being relatively simple can be learned with on the job training, categories 8-15 are more complex and factory training is essential.
- Surprisingly a simple analyzer does not require much more time for preventative maintenance vs. the more complex but the skill set is much more demanding.
- If the analyzer maintenance team is not staffed to these levels, failure is assured.
- If a tail gas analyzer is taking much more than 4 hours per month to maintain something is wrong at the sample point, *treat the disease not the symptom*.[8]

The Cost:

- Everything. If an analyzer is left wanting for maintenance it soon suffers in reliability. When that happens operators lose confidence, the analyzer is not utilized and the entire cost is a waste. The tipping point is not hard to reach but hard to come back from.

The Remedy:

- A structure and philosophy in place from the start for a preventative maintenance. Recognition that analyzers are distinct from I&E and to staff to the required levels.
- Utilize available assets for distance learning to grow skill levels. The Analysis Division of ISA (International Society for Automation) partners with two colleges to provide a distance learning curriculum ("ATOP") for the purpose of technician training. It serves as an excellent benchmark and resource for this purpose.

3.5) Sample Transport Mistakes

Sample transport is the least understood area of science of on-line analytics outside our own industry. It is dominated by the laws of physics and unlike process piping in every way. While we have detailed specifications for shelters and analyzers, not very much of the analyzer data sheets describe sample systems. It gets treated as an art form, designed and handled differently by everyone who builds one. Fundamentally, the same physical laws, chemical effects, and equally important, philosophical laws apply to each system which can perhaps be best described by; **"***Never ascribe to bad design what can be explained by stupidity, but don't rule out bad design***"**[5]

One of the classic examples in process analyzers is the measurement of low level moisture in the 0.1….1.0 ppm region and typical values for a natural gas complex. Water is a highly polar compound and there is a world of difference in transporting a 10 to 100 ppm moisture event vs. a 0 to 1.0 ppm moisture event both in wet-up and dry-down times. The following example illustrates the difference of the response time for a 0 to 1.0 ppm event for various types of surfaces at 60°C and 30m, 350 cc / min.

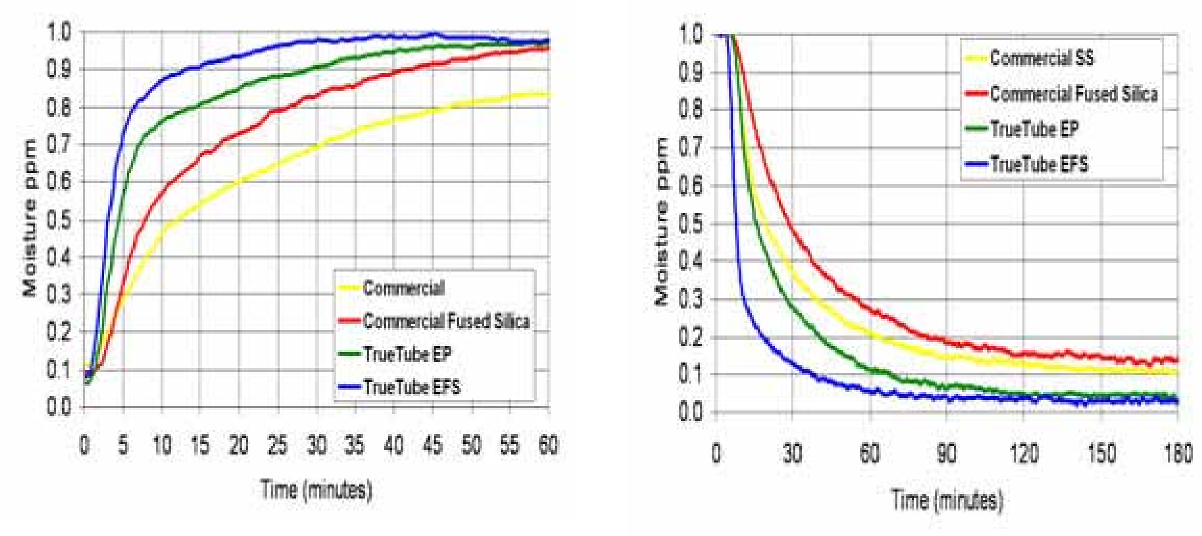

Fig. 4. Wet-up & Dry-down Times for Various Materials, 0.1 to 1.0 ppm Moisture (Conditions: Temperature 60°C, Length 30 m, Flow 350 cc/min)

There is a specific example of a current project in the Gulf. The FEED had all moisture analyzers located in a common house resulting in sample transport lines of 150m. At the insistence of the analyzer vendor, the systems integrator and the EPC a comprehensive simulation test was performed so the time lag could be quantified and the implications noted before committing to the design. At the very least the material and operating temperature of the heat-traced tubing needed to be carefully tested under controlled conditions before committing to the a detail entailing considerable cost.

Other problem areas and points to consider include;

- Effective control of the process can be achieved by placing sample taps in a variety of places. The one which gives the least lag may give the most cause for maintenance headaches. The one which gives longer lag may give more accurate and reliable results – decisions to be discussed and weighed.[5]
- Consolidating several analyzer tags in a single building for the sake of economy of scale resulting is sample transport systems are not optimized for performance. Can we rationalize the economic trade-off of the reduced cost for large, centralized shelters and higher cost and complexity for transport of samples over longer distances from the take-off point to the analyzer?.[3]
- Most process analyzer systems that require heat-traced sample transport tubing have poorly designed transition interfaces and control/monitoring systems.
- The impact of proper sample transport tubing design on analytical measurement performance is not well-understood or well-defined.
- Heat-traced tubing systems for process analyzer systems are now one of the most significant costs for the sample system.[2]

The Cost:

- The driving force behind longer sample transport distances is the cost savings realized in consolidating several analyzers into one central location, the analyzer house. The saving is a false economy if the measurement is compromised by the transport time. There is more than just a transport volume calculation to consider, there are the surface effects to consider as well.

The Remedy:

- The example of 150 m sample lines was set in stone at the FEED stage. The EPC had all systems integrators quote the long sample lines and it was not until the end user, EPC, systems integrator and analyzer vendor questioned the design that the empirical test was organized. Devote more time at the FEED stage and question the compromise vs. the savings realized for long sample transport distances.
- Engage the vendor in these discussions, no one knows the application like the vendor, they have all the scars to prove it and in the end that is what you pay for; someone not to make someone else's mistakes.

3.6) Validation; Test Results vs. Analyzer, Analyzer vs. Lab

The process analyzer world is populated by people who have to have knowledge not only of their profession but also of every process where an analyzer is in service because every analyzer will be called into question at some time. The skill set of an analyzer engineer and technician is said to be a mix of chemistry, physics, electronics, software, control engineering, sample handling, common sense, perseverance, black magic and after it is all done, the ability to persuade others the analyzer is reporting the correct value.

Some analyzers are more stable than others in terms of zero and span drift. UV analyzers for example exhibit excellent span drift qualities that are near zero, do not require routine span gas validation and the exercise should be avoided. Other analyzers utilize span filters or on-board validation resources that are traceable to National Bureau of Standards values and can be used as the reference method. Other analyzers, FTIR for example require a library data base in order to model the analysis. No two detection principles are the same.

Some of the pitfalls and mistakes;

- Operator or engineer comparing GC results with analyzer results and jumping to the wrong conclusion. In sulfur plants GC analyses are typically dry (approx 25% moisture) whereas analyzer results are always lower since they are wet by the 25%.
- For a stack analyzer in addition to moisture correction there may be sample conversion of trace species like H_2S, COS, CS_2 to SO_2 which will not agree with a stack sample by GC analysis which has been sampled carefully, quenched quickly.
- A major US refinery with span gas spending USD 1 million/year (primarily CEMs) deduced by comparison that 10% of all their span gases were delivered with incorrect values. Fresh span gas can be wrong, if suspect get a second bottle.
- It is a generalization but usually the device or analysis that is reading "low" is the one in error assuming cross interference has been eliminated. It is relatively easy to lose an analyte to reaction or absorption but nearly impossible to create it.
- Stain tubes are only accurate +/- 25% at best and subject to cross interference. Use them as indicators only because that's what they are (and correct for dry basis).
- The method by which lab samples are taken and the time from sample to lab are critical parameters. If operators are taking samples they require specialist training.
- An analyzer technician can say with confidence if an on-line analyzer is reading correctly, if in doubt, look for the not so obvious process reason.

The Cost:

- Time and resources spent in examining an on-line process analytical discrepancy.
- Damage caused by an extended excursion when an analyzer is called into question.
- An analyzer abandoned (not utilized) because the results are suspect (unexpected).

The Remedy:

- In the case of any question from operations as to the veracity of an analyzer assemble a team to look for the probable cause, assume nothing, look at all factors.
- Use all resources, contact your analyzer vendor "*have you seen this before*?" it is likely they have and the advice is free.

3.7) The Analyzer Industry Is Not Forthcoming with Information Concerning Mis-application, Interferences and Potential Contamination.

This is a self-confessed *sin* from the analyzer industry. In the interest of fair bidding practices system integrators and analyzer vendors work within a strict protocol and standard specifications. There is no incentive to point out errors or discrepancies and in fact there is dis-incentive if the knowledgeable bidder does not wish to give advantage to a competitor or sees opportunity to be low bid and gain it back with change orders.

The *sin* is characterized by;

- Critical evaluation of different analytical technology for specific applications is lacking. In many instances, there are multiple technologies available to perform a component measurement and a rigorous evaluation is not undertaken at the FEED, EPC or systems integration stage.
- Analyzer sample systems get treated as an Art-Form designed and handled differently by everyone who builds one.
- The process analytical industry does not provide sufficient information to evaluate the performance of different technologies for different applications, particularly relative to component interference and potential contamination.
- Budget constraints at the EPC level often mean only major GC manufacturers can effectively bid for huge analyzer projects. They understand their own products very well however they have much less knowledge of other analyzer sub suppliers. It is then difficult to get access to the end-user project analyzer system engineer.
- How do we differentiate the value related to performance of analytical technology so that the purchase is not just on the lowest price?[3]

The Cost:

- Not having the best available technology. Having to replace an analyzer in the early years of a project. An analyzer that is no longer supported.

The Remedy:

- Do your homework; do not take the FEED contractor's data sheets as doctrine.
- Ask for a proven track record and references.
- Ask various vendors for alternatives, attend industry conferences to stay current and get unbiased advice from other users.

4.0) Conclusions, Recommendations and Challenges

- The credits delivered by analyzers far outweigh the costs; high availability is the key to capturing the credits.[2]
- Minimum cost can lead to poor availability and high cost of ownership.[2]
- Dedicate much more attention to analyzer systems at the FEED stage, deeper intervention on the SI at the EPC stage, retain career analyzer professionals.
- Let an analyzer engineer sign off on the piping design
- Seriously rationalize the spending on HVAC and the use of long sample lines.
- Do not allow communication decisions to compromise analyzer selection.
- Move the analyzers closer to the pipe. If a closed shelter is required; use cabinets when possible and utilize analyzers houses when necessary.
- How do we engage in constructive dialogue with process designers and process control engineers to optimize process analytical measurements and performance?[2]

References:

1) Walton, Stephen., T. McMahon, J. Tatera, "PAI 2009-2012, Analysis & Forecast of Global Markets for Process Analytical Instruments Products & Services", 55th ISA Analysis Division Symposium, New Orleans, Louisiana, April 2010

2) Podkulski, D. and J. Gunnell." Stop Buying Analyzers". International Forum for Process Analytical Chemistry, January 2011, Baltimore, Maryland

3) Novak, D., "Process Analytics: Are There Dinosaurs Among Us? - The Stigma of Process Analytics". Panel Discussion, ISA Automation Week Houston TX, October, 2010

4) Dubois, R., "Process Analytics: Are There Dinosaurs Among Us? - Myths and Mistakes That May Contribute to Our Extinction". Panel Discussion, ISA Automation Week Houston TX, October, 2010

5) Harris, P., "Sample Handling Systems". O'Brien Analytical Users Conference, San Diego CA, February, 2010.

6) Walton, Stephen., T. McMahon, J. Tatera, "Survey of Process Analyzer Systems Integrators", 2010.

7) Al-Misfer, A., S.Vedula, R. Hauer, Z. Juddy, "Process Analyzer Best Practices for Sulfur Recovery, Enhanced Claus and Tail Gas Treating Applications". SOGAT Conference, Abu Dhabi UAE, March, 2009

8) Neil Holmes, Chevron USA. Conversation, January 2009.

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www.ametekpi.com

SOGAT

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