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## **FOUNDATION FIELDBUS – HITTING THE BOUNDARIES**

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The Foundation Fieldbus juggernaut is indeed off and rolling for general process control with all the benefits being well documented. All we need in Australia is the “big projects” to implement the technology. This will result in the education base being put in place along with a “Skill Pool” of Engineers, Technicians and Operators who are familiar with it.

So we have the “ball”, what do we do with it now? Where are we going in the future? There are a number of exciting opportunities, which manifest themselves because of the availability of this technology. This paper addresses the potential exciting benefits associated with a Foundation Fieldbus technical platform.

### **Foundation Fieldbus Jumping Aboard – The Future is a Knockout**

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### **Foundation Fieldbus Hitting the Boundaries**

The amazing exciting emerging technology of Foundation Fieldbus is at last a reality. After many years of “blood sweat and tears” by a motivated group of individuals we have a bat to play with, now we must go on and hit the boundaries of technological development.

This paper takes the liberty of exploring the “moonshots” of possibilities in future Foundation Fieldbus development, taking on board the “wish list” of many Instrument Engineers who are not prepared to “stick their head in the sand” for an easy life. True visionaries look beyond what we have today and our “comfort zone” to where the “base platform” can take us. Is Foundation Fieldbus a developed technology yet? Hardly- as it has only just scratched the surface of where it can go.

As an instrument engineer what is your wish list? The first wish is a Fieldbus, which becomes a “de-facto” standard. This is already happening with Foundation Fieldbus, its implementation has been excruciatingly slow. However now it is here, robust and being more readily accepted in the Continuous Process Control market. Major petrochemical utility, mining and other companies are making it a “bus” of choice. Whilst there are other buses out there, the prominent one is likely to be Foundation Fieldbus. Of course there will be a place for the alternates for instance Profibus DP in the electrical controls and discrete controls area.

The second wish is for a fully redundant High Speed Ethernet link, coming but not quite there yet.

Now for the “big plays” – with this wonderful platform what route can the bus take to reach the ultimate technological destinations?

### **Route 1 – Asset Management Systems**

It is quite likely that large Distributed Control System manufacturers will lose some of their income stream by the implementation of Foundation Fieldbus. This is because there will be no longer a need for input/output cards (these being replaced by an Interface card at the end of the home run), with control in the field the days of the multifunction controller are limited and of course the huge future capacity requirements of these systems can be downsized.

Where is the new business Genie? Smart DCS companies will see that the present benefits are just the top of the iceberg with huge potential in Intelligent Maintenance Management software.

Today the majority of instrumentation is pretty “dumb” with just a 4-20mA signal and perhaps, if one is lucky, some HART features.

Foundation Fieldbus opens a whole New World for automated Asset Management; at last maintenance diagnostics which mean something will be available. These diagnostics may include:

- Sensor degradation – This feature is likely to be comparing two sensors, one reference and the other measurement within the same device– thus when the diagnostic software sees an unacceptable level of change in the “new foot print” an alarm flag can be raised.  
*Advantages – production savings, instrument only maintained when necessary, plant full efficiency maintained.*
- “Dead Instrument Flag” – This may occur for a variety of reasons such as operator error (shut in tappings), electronic failure etc. It is likely that resonant type frequencies would be used to sense this.  
*Advantages – Advance notice of shutdowns/device failure, plant efficiency and rapid diagnosis and fault rectification. Possibly one may see software which will automatically switch to a backup processor within the instrument on primary processor failure.*

Why are there likely to be two processors in the instrument? It is considered that this will be a natural progression of Foundation Fieldbus because of the requirement to put all the instruments in manual when downloading firmware revision. By having

two processors one would be in a position to download to the “warm standby” – processor whilst still in operation. This increased reliability in addition may give Foundation Fieldbus another potential future innings to play in the "Safety Systems Arena".

- **Blocked Tapping Indication** – This feature is already being made available by one manufacturer. Just think about the occasion where a tapping blocks on a Catalytic Cracker giving incorrect measurement with a result that the Catalyst is discharged to atmosphere or ruined. The effect includes massive production loss and perhaps environmental damage. With FOUNDATION Fieldbus there will be instant diagnosis warning and “alarm” prior to complete blockage occurring, thus allowing plenty of time to recover the situation without getting caught “out” with the resulting major shutdown.

Of course these systems will also be capturing information via Foundation Fieldbus on Control and Shutdown valve diagnostics, fugitive emissions ie., leaking Pressure Safety Valves, Control outside of prescribed limits – related to perhaps pump inefficiency. Foundation Fieldbus is not just an emerging technology – it is akin to a technology revolution.

The futuristic features described are just a few of many which come to mind if one-steps outside the boundary of today’s “archaic” instrumentation playing field.

## **Route 2 - Multivariables**

Another “SIX” for FF. With today’s technology we have generally one, two or sometimes three process entries/connections per vessel (one/entry). Taking for example a typical vessel one may have;

Measurement	Entries
Level	2
Pressure	1
Temperature	1
Density	1
TOTAL	5

Once a Foundation Fieldbus installation is in place the opportunity arises for instrument companies to produce ONE instrument with a sensor array that can capture all these measurements. As a result there may only be one process entry. The advantages of multivariables with less entries mean greater plant integrity (instrument fitting failures due to poor installation are a major incident source in industry) – along with less instruments to commission and maintain. This will result in significant savings.

## **Route 3 – Safety Systems**

Call in the third umpire many will cry! Certainly it is very wise to not even consider Foundation Fieldbus for Safety Instrumented Systems (SIS) today or in the short term. It is a technology that needs to be rigorously proven in Process Control System environments first. It is not just a question of the hardware either, the

majority of engineers, technicians and users are not yet competent to use it. Thus implementing it on Safety Systems will be foolhardy unless those base competencies are in place.

There is a big “BUT” however. Wish lists must include SIS and Foundation Fieldbus, thus the technology must be developed to a robustness which can gain Safety Integrity Level (SIL) certification along with meeting the requirements of the of IEC 61508 (AS161508) or IEC 61511 (AS161511).

This is already being developed, however the “administration” must be careful not to develop a standard outside of the existing IEC guidelines otherwise the protracted standards “wars” and associated verification cycle will stymie Foundation Fieldbus use in this application for years.

Foundation Fieldbus is “made” for SIS and safety systems. For a start it has advanced diagnostics, already we have SIL rated positioners which have dual processors and associated diagnostics – hence single covert failures may become a past statistic, with the instrumentation becoming self validating.

When looked at seriously, today we have SIS transmitters which are not multi-dropped and have very limited diagnostics. With these systems the executive action will occur on loss of signal in a PSD/ESD environment, so what is the big difference? This is when the third umpire comes into play, since when things are “cut and dry” eg., a cable break or earth (no difference incidentally to what we have today) the executive action will occur. It should be noted that in a correctly maintained installation this is a rare event, however with Foundation Fieldbus there will be instant replays as there is likely to be comprehensive reporting and diagnostic availability.

Of course safety systems do not have to be constrained to pure instrumentation. As environmental requirements become stricter such things as minimisation of fugitive emissions (leaks) from PSVS and valve packing etc are going to come under the microscope by the legislative authorities. Over a plant there is likely to be a myriad of sensors, all multidropped and reporting on the status. What about self validating safety relief valves? Another big wish for any company!

## MINI FOUNDATION Fieldbus SAFETY INSTRUMENTED SYSTEMS

With the development of High Speed Ethernet for FF there is a real opportunity for Safety Instrumentation and Systems suppliers to develop mini dual or triplicated processor mini systems with a SIL rating. These would have use in smaller packages such as turbines, compressors, Instrument air systems etc. The advantage is that these systems may then interface directly with the primary SIS in a very transparent way.

## FIRE AND GAS SYSTEMS and Foundation Fieldbus

There have been addressable Fire and Gas (F&G) Systems available for years, with the technology mainly being taken up by Commercial Building fire protection. However when being considered for Industrial applications such as Offshore Platforms there has been an obvious reluctance to utilise bus type systems. This reluctance is based on robustness and diagnostic concerns.

This may change when the first F&G companies introduce FF Fire and Gas Instruments. Foundation Fieldbus will have proven robustness already in the Process Control field and with the added security that will undoubtedly flow on from the work of FF SIS committees along with sophisticated diagnostics it is virtually assured that the third umpire will give a green light to this application.

Also one of the “big ticket” items with F&G is ongoing cost of maintenance. The way most companies approach this is to check for hidden failures on a frequent basis. This can be as frequent as quarterly for Catalytic gas detectors. How smart a shot is that? It certainly is a good way of getting stumped cost wise. FF will again give us the best result owing to superior diagnostic capabilities.

How far away are Foundation Fieldbus Safety Instrumented Systems? It is likely in the opinion of the writer to be 4 to 5 years before the standards, rules, robustness and competencies are all in place. However teams are at present being set up to get things moving along. This is where YOU come into the picture, when developing systems to meet all possible scenarios and industry bases input is required – this means work – BUT – it is very rewarding to have a part to play in a technological revolution and see tangible results. To put your hand up to join the team in combat please contact [jim.russell@woodside.com.au](mailto:jim.russell@woodside.com.au).

#### **Route 4 – Ethernet will Score the Runs?**

Certainly Foundation Fieldbus has lots of runs already on the scoreboard but there is a new player in the development academy. Ethernet will provide the platform where the H1 network does not give the required bandwidth necessary for high speed applications. This includes such instruments as Analysers and sequence of event recorders. Here also comes another wish in respect to variable Speed drives as there seems to be no FF version available yet. Variable speed drives are likely to replace control valves in many applications in the future, the technology having moved on from those days of the Harmonic ASHES series.

#### **Route 5 – “What No Wires?” – The Microphone Behind Middle Stump**

Wireless technologies are well developed and may be the next logical step for the future. Do we really need wires or are we afraid to take the next step in the challenge? With processors becoming very power efficient it is likely, in the opinion of the writer, that battery based wireless transmitters are not that far away, perhaps five years. This again is where FF has the runs on the board, being a digital system it should be in a position to capitalise on this and make the transition an easy one. Lets all hope that it will not take 10-15 years for all teams to agree on this one.

#### **Route 6 – Minimal Intervention – What no Players?**

Automation, Control and De-manning come hand in hand. Without the base platform such as Foundation Fieldbus true “minimal intervention” cannot be realised. When high risk/labour costs facilities such as offshore facilities are considered – minimal or de-manning has many advantages, not only based on cost. Every person no longer required on a facility is reducing the risk. Why do we need an Offshore Control

Room and large maintenance team? The fact is today, if the full use of available technology is implemented, considerable “minimal intervention” can be achieved. If your plant has “old technology” however, opportunities for “catches” will be missed. Plants are still installing “tried and trusted” instrumentation today on Greenfield applicants – for tomorrow – what these “unwise old thinkers” are doing is ensuring that the company has no CHANCE of capturing all the benefits of the new emerging technologies. Those companies with the nerve to take up the Challenge will surely come home with the “Cup” filled with shareholder rewards.

In conclusion the Future for Foundation Fieldbus has boundaries only constrained by a “one eyed” shot. By using the full range of shots the players will score many sixes and win the game.

The final score in the Future game.

Foundation Fieldbus won, others didn't!