

Process Plant: How To Look Like A Hero.

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Would you like to knock 5%+ off your process costs? Without spending any money. Sure you would. Would your boss like you to? Sure he would. So far, so good. Now comes the tricky bit. How to deliver?

In fact it turns out it is not-so-tricky after all. The key is to take the time out to switch focus.

Operationally we normally have four primary concerns;

1. Availability; the proportion of time for which plant capacity is available for production
2. Productivity; the amount of product that can be manufactured from given plant resources/manpower
3. Yield; the amount of product that can be manufactured from given amounts of raw materials
4. Efficiency; the amount of product that can be manufactured from given amounts of energy

In practice the focus tends to be on availability; the need to avoid disruption to production. Unfortunately, in the never ending battle with availability, significant and perhaps more easily won gains from the other concerns are often overlooked. This is understandable; production disruption is highly visible and aggravating. The losses associated with the other concerns are essentially 'invisible', and do not tend to lead to heated exchanges between maintenance and operations.

Yet the government's 'Energy Efficiency Best Practice Programme' identified typical available improvement benefits as:

Energy consumption down by 5-15%

Throughput up by 2 – 5%

Yield Improved by 5 – 10%

Quality problems reduced by 25-50%

So how do you get to pocket these gains? The key is in the plant control.

Now I confess I kind of lied about the 'without spending any money' bit. But I only kind of lied; the truth is that most of these savings can be secured without high expenditure. Against the typical benefits listed above, the government guide identified payback periods of "less than a year—often much less."

You do not need massive capital spending programmes, you don't need to rip it all out and start again. For the most part the savings can be realised with modest refinements to your existing systems; very often it is a matter of appropriate configuration and adjustment. Some jobs may require additional instrumentation – hardly a big deal in the bigger picture of your plant investment.

OK you say, but how credible are these paybacks 'really'? Do a quick test, what I call 'sensitivity analysis':

Consider what a 1% improvement in yield is worth, or take 1% of your energy bill. How big a number is that? What would it justify in terms of expenditure if you were to secure 1 or 2 year payback? Do the same for quality or throughput. Then ask yourself how credible is it, if you really set about it, that you might secure this postulated saving?

Do you think improved control could deliver 1% improvement? It would be surprising if it couldn't do better than that. Then consider that many improvements will deliver on energy, and yield and quality simultaneously. You soon develop a feel for the potential scope. And remember these savings are not one shot deals, they are there day in, day out, year on year.

Don't think that these savings are only realised through 'cutting edge' control systems. In fact my advice is; if it is 'cutting edge', stay well clear - for fear of being cut. (I guess it has to be said that there are exceptions, but these need not trouble us heroes.) Einstein had a maxim that; 'Things should be as simple as possible, but no simpler'. I don't imagine he was thinking of process plant at the time (he had bigger relativistic fish to fry) but it is an absolute guiding principle for would be heroes.

You need to recognise that there is likely to be a 'reality gap' between how the plant is supposed to work, (the original design basis, what the operating manual says, the fully working systems) and the way things really are or can be, (actual operating conditions, actual operating practices, non-operational or compromised systems, the sometimes perverse way that people behave). Closing this gap is one objective.

Recognise also that the way the plant was 'supposed to work' may itself not be the optimal way. Identifying and approaching optimal operation is another objective.

Very often the practices and realities of process plant operation are imperfectly aligned with the economic objectives. As a simple example, note that plant operators will tend to operate their plant on the basis of 'MINIMUM AGGRO' not 'MAXIMUM PROFIT'. There is no point denying this reality. Would you really do it any differently at 3am? Especially when no one seems to be interested and that darned control loop has never worked properly anyway? Almost inevitably they will position set points to provide smooth, but not necessarily optimal, operation.

Accept the reality and engineer the thing so that set points for maximum profit and minimum aggro are not mutually exclusive. (It might seem perverse, but you may need to boost the aggro to get the effect you want! If you want to be a hero AND a friend to everyone, you are reading the wrong article.)

Another key to being a hero is to avoid the classic pitfalls. It really is surprising to see how often people fall in the same old holes, usually because they litter the pavement of good intentions (and we know where that can lead.)

So:

- If it's 'state of the art' be wary: 'established state-of-the-art' is OK. 'Cutting edge' may well lead to tears before project bedtime.
- Don't shoot for the moon; lower your sights and be sure of the hit. My daughter (14) tells me that if you miss the moon you end up in the stars; pretty, but not likely to cut any ice with the finance manager (47+).
- Understand the idiosyncrasies of your system; work with the grain not against it; don't insist on importing an approach from another job that may not be a good fit with the job in hand.
- Don't begrudge effort on refining the User Requirements Specification and Functional Design Specification; design in haste, repent 'at leisure' during commissioning.
- Don't use bespoke anything (especially software) – better to realign your vision.
- Don't use bespoke anything – worth saying twice.
- Address problems as soon as they are apparent (Ostriches strike me as an evolutionary paradox). Don't do the denial thing.
- Strive for your vision, but work with the realities. Don't let a noble cause lead to the denial thing.
- Listen to your operators. OK they may not use quite the right terminology, or they may have a hazy understanding of the thermodynamics, but they will have real insights into the process. They will know stuff that you will never learn from staring at PID/ELDs or talking to process management.
- Keep it modular – avoid the monolithic (big rocks are so difficult to move when you find they are in the wrong place. Think LEGO.)
- Solutions should be transparent or intuitive to the user (don't make them work for it.)
- Remember pretty much every shift team will have a gorilla – make your solution gorilla proof.

- Make it robust rather than sexy; even if it works perfectly 90% of the time, all people will see is that the glass is 10% empty. Success is digital; its either there or not there.
- Be very wary of those that don't acknowledge the 'reality gap' (and therefore risk widening it).

These 'rules' are really corollaries of Einstein's maxim. Now there will be occasions where it is right to break these 'rules'. Just be absolutely clear that there is a good, overriding business reason for doing so. (Not ego, not fashion, not excitement, not interest.)

Recognise the realities; deal with them; that is the hero's way.

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