



## **WHY WOULD YOU WANT TO OPTIMISE YOUR TURNAROUND? LOOKING AT HOW YOU CAN SAVE MONEY ON YOUR MAJOR OUTAGES – ESPECIALLY WHEN MONEY'S TIGHT**

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### **Introduction**

There are three ways which the availability and economics of a refinery can be enhanced through the introduction of a robust turnaround strategy:

1. The first is to reduce turnaround frequency, by the application of turnaround interval extension workflow.
2. Secondly you can reduce turnaround workscope:
  - a) Through disciplined control for work selection and scope growth
  - b) By, rescheduling work that does not have to be done during the major turnaround to other shutdown schedules or routine maintenance
  - c) Looking at the possibility of taking some units outside of major turnaround schedule

These by themselves do not impact availability but feed into option 3 and reduce costs.

3. The third option is to reduce turnaround duration, this can be achieved by:
  - a) Carefully and accurately planning and scheduling including critical path analysis
  - b) Adopting an appropriate work pattern for critical work
  - c) Ensuring capital projects are integrated into the overall turnaround plan/schedule
  - d) Good pre-turnaround preparation
  - e) Carefully controlled post-turnaround activities after start-up phase

### **Is It Really Worth All the Work?**

Why would you want to align the refinery turnaround strategy with the overall business plan, focusing on profitability and minimising lost profit incidents by; taking advantage of opportunities to optimise the use of resources and minimise the risks associated with turnaround cost and duration overruns, setting a specific and clear action plan from the updated strategy and milestones and ensuring that all departments at the refinery and headquarters are completely clear on roles, responsibilities and actions required?

It all seems a little bit too much work doesn't it?

### **Let Me Help You Here**

The benefits of reducing the frequency of turnarounds include:

- Reduced safety risks because the turnarounds happen less often there are fewer contractors on site and the event is better planned
- Cost saving when turnarounds happen less often and are better planned and higher availability, again because turnarounds happen less often, are better planned and are more efficient
- You get more time to plan, because there is more time between turnarounds for the planning to take place and more time to procure for the same reason, allowing for a more efficient procurement process and additional cost savings

- Finally you get less equipment stress through starting and stopping the assets less often

This gives a reduced total economic impact of downtime over a fixed long term period and allows:

- Coordination of turnarounds to optimise refinery operations, enabling the turnarounds to be executed when it is convenient to the refinery's needs
- Optimisation of capital investment projects, through coordination with turnarounds, allowing for synergy in execution of projects during turnarounds

This part of the exercise is achieved by:

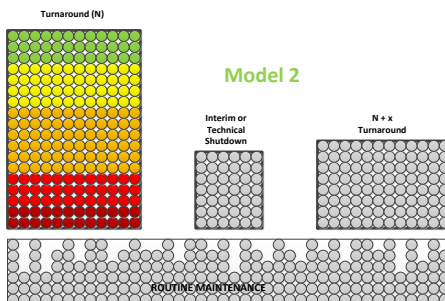
- Understanding constraints, operational, legal, unit drivers, existing strategies etc.,
- Risk assessment of current situation and future strategies
- Developing solutions to manage constraints

Is this starting to appeal yet?

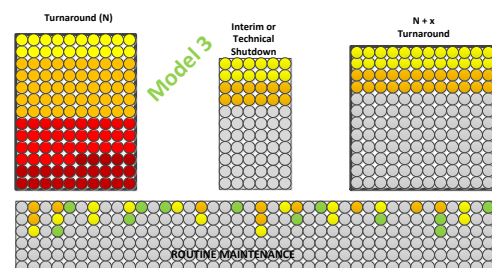
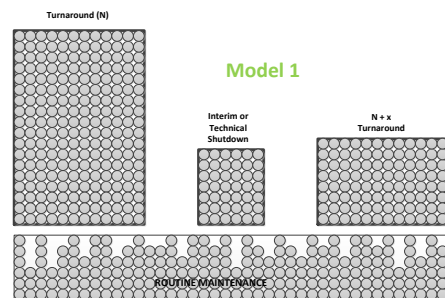
The second string to our bow is scope optimisation of the turnaround, which is best practice in leading refineries, this; increases asset availability through reduced downtime and reduced downtime means more time for equipment to be on-line and operational, increasing asset availability and overall reliability. Turnaround optimisation reduces maintenance activity through risk based work selection which; is used to reschedule work outside of the main turnaround to either routine maintenance or to technical shutdowns. After the scope is optimised the detailed planning and scheduling of the remaining work will determine the critical path and therefore the turnaround duration (reducing this of course is our third objective), this in turn reduces the cost of the turnaround; it is calculated that the cost of turnaround work is typically 100% more expensive than routine maintenance.

Model 1 shows a non-optimised shutdown, with everything crammed in regardless of its importance. Routine maintenance workload is erratic and therefore at a higher than optimum cost.

Model 2 is the first step along the way where there has been an attempt to prioritise the work but no attempt has been made to move any of that work and the routine maintenance situation remains the same.



Model 3 is when it gets interesting; this shows an optimised turnaround strategy model. The green jobs and some of the yellows and orange jobs have been moved out of the current turnaround. Some have been moved to routine maintenance, some to the next technical or interim shutdown and some to the next turnaround. Some jobs which are time based may have had their risk changed due the elongated period between the maintenance. The advantage of this model is the workload and the duration of the current turnaround has reduced and the technical shutdowns are used to complete maintenance work without increasing their duration. A further advantage is the routine maintenance workload has been stabilised, which enable a much more predictable resource requirement, which will subsequently lead to a better platform for contractor negotiation (if appropriate) and the opportunity to get a more stable and better trained technicians.





## Pause for Thought

So far we have ensured that there is the maximum time between turnarounds and we have looked at prioritising the work so that we only do the important jobs in the turnaround. This in turn has allowed us to reduce the amount of work we do in our shutdown window and reduce the length of time our facility is shutdown for turnaround by determining a robust critical path. We now have safer turnarounds because they happen less often, for shorter periods of time and with fewer contractors on site. We also have more cost effective shutdowns for the same reasons.

Remember, no amount of control during a turnaround can make up for inadequate planning and preparation and a successful turnaround must execute the correct work safely and efficiently in the minimum time to meet the strategic objectives of the site.

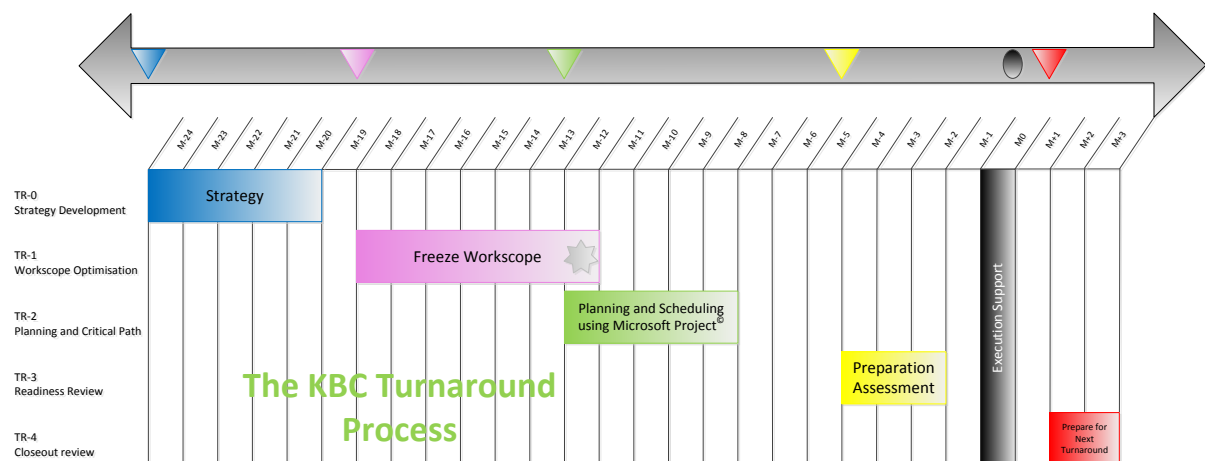
Adding to our cost benefit, we have better planned shutdowns because we do less work less often, we have better procurement ensuring we get the right spares at the right price and we have a more efficient routine maintenance team, who, by the way are also more competent.

The final benefit we've identified is we have less equipment stress because we start and stop it less often; we maintain the equipment more effectively and we do the right work on the right equipment at the right time, thus increasing equipment reliability and availability.

Are you seeing the benefits for your organisation yet?

KBC has a clearly defined process which it applies to turnaround activities which has an excellent track record of delivering across the world.

The KBC turnaround process diagram below shows how the blocks fit together. We help our clients decide what the best strategy is for them, once we have done that we help them to execute that strategy. Our modules show the way to workscope optimisation through a risk based approach; this gives the minimum workload. We then go on to optimising the planning, scheduling and critical path this gives the shortest duration.





## ***TR-0: Strategy Development***

In turnaround strategy development, the emphasis is on alignment of your refinery turnaround strategy with your overall business plan, focusing on profitability and minimising lost profit opportunities. A strategic review conducted with a comprehensive understanding of your business priorities, market demand, logistics, maintenance needs and operational bottlenecks, help in shaping up a long-range plan for your site and develop a master turnaround schedule.

This is a continuous process and will need to be updated after each turnaround package close-out.

## ***TR-1: Work Scope Optimisation***

The turnaround team, as determined during the TR-0 process, collects a preliminary work list from your maintenance management system, your last turnaround inspection reports and other information sources to make sure that all potential work for the next turnaround is captured. The workscope is reviewed by the team using a risk-based work selection methodology. This review is to ensure that the scope is not extended unnecessarily by work items that are feasible for routine maintenance.

Once the turnaround work scope is frozen, hopefully twelve months before execution date, any additional work has to be properly justified and approved by the relevant manager. This process again uses a risk management approach and should follow established forms and guidelines. During the execution of the turnaround, any discovered or emergent work shall undergo a similar process, however, it should be applied with haste so that any delays in the decision process should be minimised, if not eliminated.

## ***TR-2: Planning & Scheduling***

A preparation timeline that shows the responsible party and activity matrix will be generated to monitor and track the turnaround team and steering committee team progress, through the various turnaround planning and execution phases. The schedule should show a summary of activities but will be detailed to include all the focus areas and deliverables required to prepare for the turnaround.

The turnaround team will work to finalise the monitoring and tracking reports, change control procedures and departmental execution plans. This formalised execution plan will be the basis by which the turnaround will be executed and managed. The turnaround team will complete the logistical planning and preparation for the turnaround by establishing the plot plan, temporary facilities locations, plan for utilities and set the communication protocol during the turnaround.

## ***TR-3: Readiness Review***

Approximately two months before turnaround execution, a readiness review will be conducted, facilitated by independent reviewers. The purpose of this review is to investigate all aspects of turnaround preparation and identify areas where added preparation may be justified in order to reduce risks to turnaround success.

## ***Execution Support***

This supplementary module incorporates KBC's ability to assist the client in the execution of the turnaround. The main objective of this is to help the client manage the critical path and advise on any emergent issues.

KBC can also advise on inspection, commissioning and start-up issues which may arise during the delivery phase of the turnaround.



## **TR-4: Closeout Review**

The closeout review is to capture lesson learned from the preparation, planning and execution phase of the recently conducted turnaround. The turnaround team collects, organises, updates and shares all relevant turnaround documents and uses these documents in the turnaround planning process during the preparation phase for future turnaround events.

A series of meetings should be organised by the turnaround team to review major topics and areas for improvement. Areas for improvement must be identified and action steps with assigned responsibility to take action and complete. The following discussion topics for the turnaround close-out review shall be:

- Safety
- Budget
- Schedule
- Engineering/Inspection
- Contractor
- Lessons learned

These closeout activities should be completed within 2-3 months of the completion of main turnaround execution.

## **Conclusions**

In your business you have to have turnarounds, the process units may need to be shut down for a number of different reasons including:

- Rehabilitation to return equipment back to it's as new condition to ensure that it will continue to give acceptable performance until the next scheduled turnaround
- Operational reasons i.e. the replacement, partial replacement or regeneration of catalyst, internal cleaning of equipment which is showing a reduced level of performance
- Industrial safety requirements or safety inspections, these may be dictated by legal requirements or by best practice on pressure vessels, relief valves or safety instrumentation for example

The turnaround cannot be avoided, we do however need to carry out the maintenance work safely, correctly, cost effectively and risk based, we also need to carry out maintenance which is not detrimental to our reliability and availability.

We have seen that this is possible, by following KBC's established, proven turnaround programme we can:

- Be safer, which minimizes losses due to fewer personnel injuries and equipment damage which have both serious organizational and PR implications AND minimizes the potential for major schedule disruptions. End result – saves money and improves profitability through loss avoidance
- Improved equipment availability through shorter less frequent turnarounds – saves money and can have an enormous impact on capturing operating margins
- Be more efficient – saves money
- Plan better – saves money and improves safety
- Procure better – saves money
- Do less work, less often – saves money and reduces risk potential
- Shut our plants down for shorter periods – saves money
- Increase reliability and availability – saves money
- Shut down and start up more efficiently – saves money and improves safety



# WHITE PAPER

A Yokogawa Company

June 2016

So everything we do during the programme will save you money and lead to safer operations (and I haven't covered everything in this paper), so if you're interested in saving money and I've got your attention, contact KBC for more information.

## About KBC

KBC Advanced Technologies is a leading consultancy and software provider to the global hydrocarbon processing industry. With over 30 years of experience, KBC combines industry leading technology with experienced engineers and operations personnel using robust methodologies to create personalised, sustainable solutions for its clients.

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