

Opportunities & Challenges in Downstream Process Integration

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Process integration is seen as a good opportunity to achieve capital cost savings and energy optimisation in downstream processes. Savings can be made by efficient use of waste heat and elimination of redundant equipment. The Integrated Gasification Combined Cycle (IGCC) power block is a good example of a process which has become highly integrated over the last 25 years. This has been done in order to reduce capital and achieve a more sustainable energy performance. Highly integrated processes demand a different approach in project development, project execution and operations to ensure that execution schedules, commissioning time and availability are not adversely affected by the interdependence of the process units.

This paper addresses the challenges encountered in designing, commissioning and operating a highly integrated process and presents recommended solutions to ensure that the benefits of integration are fully realised without impacting other project critical success factors. In a simple process the product flows sequentially from one unit operation to the next. I.e. Unit A through unit Z.

Start-up is simply a case of starting each unit in turn. In a highly integrated process everything is interconnected and unit Z may be required to be partially operational to start up unit A.

The problem can always be solved by having lots of redundant equipment “just for start-up”. This adds capital back in to the project and defeats a key objective. High levels of integration also pose challenges for availability. The so called “domino affect”. If unit Z can cause unit A to shut down then the consequences are obvious.

In the conceptual design of the project careful thought is required to work out if redundant equipment or product inventory is needed to break the interdependence of the process units and where in the scheme it is best placed to achieve the maximum benefit at the lowest capital cost. The best solution may not always be the most obvious. Planning start-up of such integrated units should be done in the very early conceptual phase of design. The maximum load on a given process unit may be in a transient start up case and not in normal operation. “Boot strapping” Process Units which are dependent on each other may require special consideration.

Once the plant is operational the high level of interdependence of the process units requires very close cooperation between the operating teams of each Process block. Efficient operation demands that the units are not operated conservatively to achieve the best economic performance. Operating aggressively means there is less room for error. Achieving high availability requires very good communication and production planning.

This paper will address the specific challenges and some successful solutions for IGCC.