

Alternative Fuels Plant Optimization: Mitigating the Risks - Part I

Written By:

Paul Schoen

Paul.schoen@harrisgroup.com

Senior Process Engineer

Harris Group Inc.

www.harrisgroup.com

Plant optimization can be an effective way to achieve improved profitability without the large investment associated with building a new plant. However, each project is unique and the number of failed projects in the chemical processing industry reminds us of the risks that may not be associated with new “greenfield” installations. This article focuses on suggested means for reducing or eliminating risks associated with revamp projects.

For alternative fuel plants there are two principal objectives that would provide justification for a revamp:

- Increased production

Incremental increased production can sometimes be achieved by elimination of a few bottlenecks in the process.

- Improved operating efficiency

Modifications can be made to reduce energy costs and/or resource consumption.

The plan for a revamp project should include means for handling typical project risks, including:

- A project scope of work which is difficult to develop and control
- Deficiencies in the process which are not understood
- Information about the process (drawings, process information, etc.) that is incomplete or wrong.
- Dealing with continuous operation of the process while trying to get information and take precise measurements.
- Performing the installation in a limited time frame
- Having deteriorated or out-of-compliance structures and equipment
- Using auxiliary equipment and systems that will not provide support for the requirements of the core equipment or the planned changes to the process.



Years of revamp experience have enabled Harris Group Inc. to develop a list of typical risks and some suggested approaches to mitigating those risks. These suggestions can be applied to any project undertaken in any operating plant.

The list of risks explored here in Part I of this paper include:

- Excessive Shutdown Time
- Scope Creep
- Lack of Support During Construction
- Inappropriate Contracting Style
- Lack of Complete Engineering
- Analyzing the Process for the Entire Operating Range

Risk Area	Suggested Approach
-----------	--------------------



<p>Excessive Shutdown Time</p> <p>Taking a plant out of production for a major revamp can be a traumatic experience. Not only is the bottom line impacted but also arrangements have to be made for customer support during this period.</p> <p>The final shutdown to accomplish a major revamp can be likened to a major battle in a war. The organization, planning, and logistics effort are significant. The work has to be accomplished with a large number of workers in a confined space. Well-done revamps can come off very close to “on plan”; others have run considerably over schedule.</p>	<ul style="list-style-type: none"> ❑ Have a work plan detailed to the point where every activity is identified prior to the shutdown. ❑ Do as much pre-assembly of equipment and piping as possible prior to the shutdown. ❑ Don't schedule the shutdown too tight with the delivery of key components. ❑ Hire a contractor with a proven track record on this kind of project. Their experience must include good safety performance, and the availability of good planning and scheduling personnel. ❑ Have a construction contract in place, which doesn't interfere with work progress. Make early completion of the work an incentive. ❑ Use pre-assembled equipment “modules” where items such as smaller tanks, pumps, motors, piping, and some instruments can be pre-assembled on a fabricated skid.
<p>Risk Area</p>	<p>Suggested Approach</p>



Excessive Shutdown Time, continued.

- ❑ Check other plants in the area for timing conflicts. They may be doing a major revamp at the same time you are, overloading the construction resources in the area.
- ❑ Avoid scheduling the work over a holiday period. Workers may be hard to obtain and premium costs will be high.
- ❑ Do as much work on preliminary shutdowns as possible including all tie-ins. Some systems can be started up early on. (Be careful of interim capacity issues if that is done.) Early startup of items such as DCS systems - even on a limited number of control loops - can help with operator training.
- ❑ Understand the tradeoff between measures to reduce downtime and project cost. Some of the items discussed to reduce downtime will add to the project cost.



Photo Courtesy of the Department of Energy

Risk Area	Suggested Approach
<p data-bbox="186 317 375 352">Scope Creep</p> <p data-bbox="186 394 704 506">Process plant revamps are notorious for exceeding budgets. There are a number of reasons for this:</p> <ul data-bbox="186 554 748 1220" style="list-style-type: none"> <li data-bbox="186 554 748 747">• Unreasonable management expectations of the potential cost. Every revamp is different and cannot be directly compared with previous, similar, projects. <li data-bbox="186 747 748 863">• Not doing enough analysis of the process as it exists to know what needs to be done. <li data-bbox="186 863 748 1024">• Not performing enough up-front engineering and design to the point a solid/complete scope of work can be prepared. <li data-bbox="186 1024 748 1140">• Not having adequate up-front input from production, maintenance, and construction. <li data-bbox="186 1140 748 1220">• Having an inadequate contingency allowance for the project. 	<ul data-bbox="824 394 1385 1268" style="list-style-type: none"> <li data-bbox="824 394 1385 747">□ Put together a team consisting of plant engineering, production, and maintenance staff together with outside consultants and an experienced contractor. Empower the team to make decisions relative to the project scope and estimate. Make the team responsible for managing the project cost. <li data-bbox="824 768 1385 1003">□ Where plant staff is involved, free them from normal duties enough that they can devote adequate time to the project. On a large project, this may mean full time dedication to the project. <li data-bbox="824 1024 1385 1140">□ Have a good scope change/approval process in place as soon as the project is approved. <li data-bbox="824 1161 1385 1268">□ Plan on spending enough, as the project is developed, to have a well-detailed scope.



Risk Area	Suggested Approach
<p data-bbox="186 342 737 378">Lack of Support During Construction</p> <p data-bbox="186 422 699 573">Some processing plant projects have lacked enough support staff during construction, especially during the major shutdowns.</p>	<ul style="list-style-type: none"> <li data-bbox="824 422 1382 653">❑ Make sure enough plant staff is dedicated to the project during construction. These people can be a tremendous asset to the project because of their knowledge of the plant. <li data-bbox="824 674 1382 789">❑ Include the people who were involved during the design in construction support. <li data-bbox="824 810 1382 1083">❑ Make sure that shift coverage is included for the above-mentioned people as well as vendor erectors and commissioning/startup people. Where vendor and other outside help are needed, arrangements need to be made well in advance. <li data-bbox="824 1104 1382 1220">❑ The costs associated with the above needs to be included in the project budget.



Photo Courtesy of the Department of Energy

Risk Area	Suggested Approach
<p>Inappropriate Contracting Style</p> <p>The type of construction contract used may not be appropriate for a revamp project. No matter how well the project is planned, unforeseen changes will occur. In the case of a lump sum approach, change orders will be especially hard to manage especially with a substantial percentage of the work compressed into a final shutdown.</p>	<ul style="list-style-type: none"> ❑ Consider a cost plus fee arrangement for the construction contract with an experienced revamp contractor. ❑ Employ the contractor's services early in the project – even during the scope development and estimate preparation. Contractor input on constructability and construction methods is valuable.
<p>Lack of Complete Engineering</p> <p>There are a number of methods being used to reduce engineering costs. In alliance arrangements the designer sometimes only issues sketches to the contractor for certain types of work. This approach while suitable for small plant projects may not be adequate for revamp work.</p>	<ul style="list-style-type: none"> ❑ Make sure the design engineering approach is suitable for a revamp project. Pre-fabrication of piping and modules should be as complete as possible and done well in advance of shutdown. In order to accomplish this, design must be carried to a detailed level and must be accurate.



Risk Area	Suggested Approach
<p>Analyzing the Process for the Entire Operating Range</p> <p>There are some classic cases where the new equipment and systems do not fit the actual operation after the revamp. Many systems also have a significant turndown in production rates compounding the overall sizing issue.</p>	<ul style="list-style-type: none"> ❑ The design criteria for the project must reflect reasonable values to meet the project objectives. Expected / required turndown must also be considered. ❑ Flow balances and other design must be done considering the range of operation. Collective judgment must be used to set reasonable operating ranges for the process. If there is a significant turndown requirement, special design considerations must be made. ❑ Everyone must understand the implications of trying to operate over a wide production range. Issues relative to this should be stated in the project write up and risk analysis.

In Part II of our series, the following risk areas will be examined.

- Inadequate Auxiliary Systems and Equipment
 - Conflict with Maintenance Work During the Shutdown
 - Materials Missing When Needed
 - Are Expectations too high?
 - Commissioning and Startup Problems
 - Training
 - Code Compliance Issues
-



About Harris Group Inc.'s Biorefining Unit:

Harris Group Inc.'s biorefining unit provides full-service engineering and consulting services in the production of energy and chemicals from renewable feedstocks through sustainable technologies.

Our experience encompasses developing biomass processes that convert industrial, agricultural and municipal feedstocks into ethanol, biodiesel, biogas (methane), commodity chemicals, and other saleable products and byproducts.

Harris Group has worked alongside industry innovators, national laboratories and our customers to deliver process and design improvements for a variety of applications. Our goal is to make end products like ethanol, biodiesel and biogas highly competitive with fossil fuels and other comparable products.

Harris Group Inc. provides strategic support from feasibility through plant start-up with a core service of engineering and plant design. Specialty services include process conceptualization and development, research management and coordination, basic and detailed engineering, owner's engineering, financial due diligence and independent engineering, feasibility evaluation, process improvement and control systems integration.

For more information on how Harris Group can help with your existing alternative fuels facility or plans with your new facility, please contact:

Ken Wenninger
Corporate Director of Marketing
Harris Group Inc.
200 West Thomas
Suite #200
Seattle, WA 98119

1.800.488.7410

ken.wenninger@harrisgroup.com

