Alternative Fuel Plant Optimization
Mitigating the Risks – Part II

Alternative fuel plant optimization programs 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 such projects.

In optimizing alternative fuel plants, there are two principal advantages that can provide justification for the program:

- 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 an optimization 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 plant optimization experience has enabled Harris Group 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.

In Part I of this paper – the following risks were discussed:

- 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

Here in Part II, the following risks will be explored:

- 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

Risk Area	Suggested Approach
Inadequate Auxiliary Systems and Equipment The project objectives will not be met unless all of the systems and equipment can function together under the design conditions.	❑ An adequate survey of the existing process and all of the auxiliary systems is needed to benchmark capacity. The needs of the new equipment and systems need to fit the available capacity of those systems.
Conflict with Maintenance Work During the Shutdown Material laydown areas, congestion and crane uses are typical issues. The plant maintenance department will understandably want to take care of major maintenance during extended shutdowns.	❑ Maintenance activities must be included in project planning as much as if they were part of the construction. Crane use, for example, must be coordinated with lifts required for equipment installation.

Risk Area	Suggested Approach
Materials Missing When Needed • Because so much of the work on an optimization project is done during shutdowns, all materials must be purchased and available as needed for the work. • Items removed during the early part of the shutdown – which have to be reinstalled – may end up disappearing.	❑ Have a material coordination plan which identifies who is responsible for purchase, expediting, and storing all materials. ❑ Make sure adequate time is given for manufacture and delivery of vendor supplied equipment. ❑ An experienced contractor will have systems in place for securely storing and managing materials. ❑ A plan should be in place for laydown areas and methods of staging equipment and parts in sequence for their installation. ❑ Shipments of vendor-supplied equipment should be adequately checked for completeness when it arrives – even if it means un-crating. ❑ Parts that are removed early in the shutdown which must be re-installed later, must be properly tagged and stored.

Risk Area	Suggested Approach
Are Expectations too High? Expectations for the project must be tested against the risk that they might not be possible given the amount of funding that can be justified. Few plant optimization programs have been extensive enough to equip the process for operation equivalent to a new installation.	❑ A survey of similar vintage plants making similar upgrades is a good way to review the achievement "risk" of the project. ❑ Suppliers and outside consultants can provide input. ❑ A "due diligence" review of the project is a necessity – whether it is done internally or with outside assistance.
Commissioning and Startup Problems The plant is restarted with new equipment and new systems installed. Sometimes getting old equipment started up under new conditions can be a bigger issue then getting the new equipment started up. During lengthy shutdowns, materials left in pipelines can harden, motors can take on moisture, etc.	❑ Planning a major plant optimization program should include measures needed for laying up the existing equipment and systems. Proper flushing should be done. If required, heat should be put on motors during the outage. ❑ A commissioning and startup plan needs to be in place. A designated person should be responsible for overseeing the activities. Teams of people should be made available for this project phase. ❑ Don't forget to include restarting of existing systems and equipment in the commissioning plan.
Risk Area	**Suggested Approach**

Training A major optimization program can drastically change the configuration and operation of a process plant. In some cases commissioning and start up after an optimization program can be more difficult than that of a new system.	❑ Make sure that planning for the optimization program includes adequate training for operators and maintenance. A long shutdown period can provide an opportunity for some of the classroom training. ❑ Include operators in the preparation of training manuals – long before the shutdown. ❑ Use operators during the shutdown period to tag equipment and piping. Operator assistance during commissioning is extremely important. ❑ Make sure the budget includes funding for adequate training. ❑ If a new control system is being installed (i.e. DCS upgrade), pre-install an operator's station with a few loops in a well-defined system to get operators up to speed on the new equipment.
Code Compliance Issues It is often found that old electrical equipment is not suitable for the modifications necessary to support an optimization program. Structural codes also change over time. New and/or additional loading may require seismic reinforcement. Building officials are becoming more involved in the work being done within process plants to ensure the work meets code. The cost of some of this work, added to the project, may make the project	❑ An engineering review must be done on the existing facility to determine its situation relative to appropriate codes. ❑ As the project scope is developed the impact of the new systems and equipment on the existing facility must be analyzed. If needed the existing structure(s) may have to be reinforced. Electrical equipment may have to be replaced. ❑ These items cannot be ignored and

impossible to justify.	may have a significant project cost impact. Requirements must be determined as early in the project as possible.
Code Compliance Issues (continued) **Pre-Wired Electrical Equipment** In some cases, factory pre-wired equipment has to be re-wired in the field because it doesn't meet code.	❑ Make sure your specifications require any pre-wiring to be done to code and that it is properly stamped. Satisfy yourself that the supplier knows what your specifications mean.
Code Compliance Issues (continued) **Deficiency of Machine Infrastructure** It is frequently found that there is a problem with part of the process or the infrastructure that is in poor physical condition and has to be fixed as part of the project, even though it might be charged off as maintenance. An example would be badly corroded structural steel under a mezzanine. Repair of this needs to be done so that additional loading can be placed on the mezzanine.	❑ A plant infrastructure review needs to be included in any assessment of the plant as part of the rebuild scope preparation. Even though it may not be part of the capital project, any work on such an item will impact project work.
Code Compliance Issues (continued) **Asbestos** The presence of asbestos is sometimes not identified early. Its removal during a shutdown is a major schedule and cost issue.	❑ Make sure that a survey is done early of all potential areas where asbestos can be found on equipment, structures, or piping and develop a plan for its removal.

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.
http://www.harrisgroup.com
200 West Thomas
Suite #200
Seattle, WA 98119

1.800.488.7410

ken.wenninger@harrisgroup.com