What You Should Know About Modular Process Plants

By Rocky C. Costello, P.E.

R.C. Costello & Assoc., Inc
- Consulting Engineers -
1611 S. Pacific Coast Highway, Suite 210
Redondo Beach, CA 90277
310.792.5870 FAX 310.792.5877
E-mail: mailto:rcca@rccostello.com
http://www.rccostello.com/

Modular construction is one of the most efficient and cost effective methods of construction. The advantages can include:

- Lower construction costs
- Single point construction responsibility
- Reduced interruption to existing operations (in case of plant expansion or modification). The modules can be setup only a few days and plant can be operation in weeks instead of months.
- Reduced construction infrastructure at your site
- Improved site safety
- Higher quality workmanship
- The best choice for construction in remote locations
- Skids can be moved to another location at a later date
- Skids can be fitted into sea containers for export

Important considerations in designing a skid mounted unit are:

1. Accessibility is of the utmost importance in Skid Design so be sure that you plan carefully. How will you take the ends off of heat exchangers for cleaning? How will you enter vessels for inspection? Can you access your field-mounted instruments for replacement, cleaning, etc? Thoroughly review your layout. It can be difficult and costly to move equipment around later.

2. Prepare your AutoCAD design drawings in 3D solid and perform virtual walk-throughs. This is the best way to assess maintainability and look for piping and equipment interference.

3. A virtual model can be an important tool that allows you to train your operations staff for months prior to facility start-up.

4. Process Control Systems - The choice here dictates one of the major costs you will incur in the design of your unit. Putting the PLC in a panel on the skid dramatically reduces your wiring since all the instrument wiring is now on the skid. The Man Machine Interface (MMI) which is normally a PC can now be placed in a remote control room with only a single Ethernet cable such as a category 5 cable running between the PLC on the

skid and the remote PC. The PLC however may require a NEMA 7 or 9 explosion proof cabinet. The alternate to this is to remotely mount the PLC in the control room with the PC. This is expensive because now there is a twisted pair with a 4-20 ma signal for every field instrument from the skid to the PLC. In addition there is a 110 volt pair for every temperature switch, pressure switch, level switch, flow switch, etc. from the skid to the PLC. This however can be overcome with a remote IO panel on each skid and a Cat 5 cable running from each of the remote IO panels to the PLC The situation for the motor control center is the same and you must consider remote or local again.

5. The MCC can be on the skid, on its own skid, in a building or in a portable building. This is somewhat dependent on the number of skids required also.

6. For large distillation, absorption, or scrubber columns there are two methods of installation. They are as follows:

    a. Large columns are mounted to the side of the skid on a separate foundation.
    b. Large columns are mounted through a structural hole in the skid frame on a separate foundation. From a distance the column looks as though it is mounted on the skid.

    The bending moment generated from wind loading on the column would cause it to shear away from the skid if the column was direct mounted.

7. Insure that the crane you have on site is large enough to handle the skid. There is nothing more frustrating than to hear "The crane is too small to lift the skid," on the day the skid is delivered.

8. If you require a portable control room install it upstream of the prevailing wind.

9. Non-slip grating should be installed over the surface of the skid. This prevents falls and allows rain and snow to pass through the grate,

10. In skid mounted pilot plants additional equipment has a way of being added on. Allow adequate room around the skid for future expansion.

11. In plants that are severely restricted for space, you can have multilevel skids that stack one upon the other. This can also eliminate some process pumps, since liquids can be transferred by gravity from vessel to vessel.

12. Install pole mount illumination lights around the skid after installation. Install safety rails or poles near the skids where vehicles approach the process plant to prevent forklift damage to equipment on the skids. This allows for easy access for the crane when setting the skids in place.

13. Pilot plants should have extra nozzles on process vessels to allow for future piping modifications and allow for additional instrumentation.

14. Once the skids have been delivered check all flanges and retorque the bolts. The bolts can come loose during shipping.

Some typical plants that have been skid mounted are:

Batch Distillation units
Continuous Distillation Units
Pilot plants of all types
Chemical Plants
Polymer Plants
Biodiesel plants
Flow Chemistry plants

R.C. Costello & Assoc., Inc. provides engineering design services to the process industries. We utilize process intensification when warranted. We also provide environmental compliance support and process safety services.

Rocky C. Costello, P.E.

R.C. Costello & Assoc., Inc.
1611 S. Pacific Coast Highway, Suite 210
Redondo Beach, CA 90277

Tel: (310) 792-5870, Fax: (310) 792-5877
E-MAIL: rcca@rccostello.com

http://www.rccostello.com/

Additional Web Pages:
Process Intensification: http://www.rccostello.com/process_intensification.html
Distillation: http://www.rccostello.com/distillation.html
Klaren Self Cleaning Heat Exchanger: http://www.rccostello.com/klaren.html