



Off-The-Shelf SRU's Design

Mahin Rameshni, P.E. President & CEO, Rameshni & Associates Technology & Engineering LLC

Some companies consider using the concepts of the cloned units, off-the-shelf sulphur recovery units, and relocation of used units. Resurrecting past designs can reduce engineering costs by 50-75%, but modifications are always required. By recognizing potential bases for change at the outset, pitfalls can be avoided. The following are the key parameters that should be considered.

License of the unit

In recent years, some refineries have evaluated their future capacity requirements with a plan to build new sulphur plants in different phases. In this case, the owner will ask for the cost of the future duplicate and the license fee.

If the modified design is by a different engineering/procurement contractor (EPC), third party license fees may be involved. In the absence of a formal license, there may be proprietary process or mechanical design features with legal or ethical implications. Internal legal review may be required to determine to what extent you are free to duplicate equipment without permission. Consider what reasonable steps, if any, are warranted to preserve propriety.

The original designer is less likely to share its design if the new EPC is a direct competitor. In one instance, a client desired to convert its tail gas treating unit to a different process offered by a competing licensor. The original licensor refused to grant the new licensor access to the unit necessary for the mechanical design modifications. Ultimately, the two process licensors agreed to the client's use of a specified third EPC for the mechanical design.

The original designer likely assumed a degree of liability, usually in the form of a performance guarantee. The new EPC may not be in a position to similarly guarantee performance. If not, the risk to the client must be weighed.

Once those hurdles are cleared, the focus is on identifying and assessing differences in the design bases.



Feedstock

The most obvious potential differences lie in rates and compositions, but other factors may be less evident. For example, unspecified trace organic contaminants can de-rate the plant by consuming air and fouling the exchangers and catalyst with carbon. There could be greater potential for extreme turndown in the new plant, or sudden major feed reduction, which may warrant more sophisticated control schemes.

Reliability

Reliability might be more important in the new plant by virtue of less spare capacity, fewer multiple units, proximity to the community, more stringent regulations, fewer upstream load-shedding options or increased constraints on acid gas flaring.

The relative reliability of steam and electricity can influence choices between critical turbines and motors.

Geography

Mechanical design modifications may be required by major differences in weather and other natural forces such as temperature extremes, hurricanes, tornadoes, monsoons, earthquakes, high water table, permafrost and contaminated soil.

The new site might be more remote, with adverse impact on shipping, waste disposal and contract services such as mechanical/chemical cleaning, rotating equipment repair, catalyst change-out, amine/glycol reclaiming, refractory repair, corrosion inspection and turnaround work forces.

Operating & Safety Philosophies

Existing operating procedures at the new facility should be reviewed to determine if any design modifications are necessary to conform to established practice for such activities as startup and shutdown. There may be special blinding requirements. For example, some plants require blinding every vessel nozzle, where flanges may not previously exist.

Local mindsets can differ with regard to many operational issues as well. Some facilities rely heavily on auto-start of spare pumps and blowers, while others avoid them religiously. Some plants may want most motors to automatically restart upon restoration of power following a brief outage, while others might require manual restart with an operator in attendance.

Sometimes local PPE requirements are so burdensome that the only way to reasonably ensure routine sampling of hazardous streams is by the provision of sophisticated enclosed sampling systems designed to contain toxic vapors and corrosive spray.

Occasionally a plant will adopt extreme protective requirements for certain specific activities in response to an unfortunate local incident.

Control Philosophy

Some control schemes may require modification to be consistent with local practice.

In the absence of rigid corporate standards, burner management systems will likely differ between locations with regard to light-off procedures and automatic safety shutdown provisions. This is an area where it is particularly important to conform to established practice in order to minimize operator confusion during upsets.

Procedures may differ for verifying the integrity of safety shutdown systems. Some plants may opt to actually trip the unit periodically, while others will incur substantial added expense in order to provide piping bypasses around shutoff valves in order to verify proper response without interrupting operation.

Plot Constraints

If the original plant was limited on plot space, the clone will be unnecessarily congested. If the new plant is constrained, the original design must be modified accordingly – possibly to the extent of requiring all new piping designs.

Hydraulics

Pump and blower discharge head requirements can change as the result of changes in piping layout, battery limit supply pressures and off-plot rundown distances.

Utilities

Existing steam pressure levels at the new facility may differ from the original site, potentially impacting the size and rating of exchangers, turbines and piping. Steam balance differences can also effect choices between turbines and motors.

The new site may lack an existing N₂ system, which may have originally been a key component of automatic safety shutdown systems and instrument purges.