Comparative Analysis of Super Skidding vs. Stick Building Projects in Pharma Manufacturing

Provide an unbiased perspective on this discussion.

JBT A&B PROCESS SYSTEMS

The discussion regarding the advantages of "stick building" compared to "modular skids" fabrication seemed settled in the past. However, recent trends indicate a renewed interest in examining these two distinct methodologies for expanding pharmaceutical process capacity. Notably, the resurgence in stick-building preference appears influenced by contemporary supply chain issues and the urgency to accelerate capacity deployment.

Building Quality Solutions

Super Skidding, the method of prefabricating major components off-site before assembly, has become the default method of building new capacity for its potential **to expedite project timelines** and improve cost predictability. **Stick Building, the traditional on-site construction method**, embraces a meticulous and phased approach. It allows for **flexibility** in design changes and adjustments during construction. In pharmaceutical projects, Stick Building offers the adaptability needed for facilities with unique specifications or those subject to evolving regulatory standards.

This article doesn't claim to be the final word on which method is "best" or "optimal." Instead, it dives into the various considerations influencing the choice between these approaches, and whether a blend of the two might be the solution, as it frequently is. At **JBT A&B Process Systems**, given that our operations are almost evenly split between skid fabrication and field installation, we believe we're well-positioned to provide an impartial perspective on this discussion.

Facility Access

When considering the quickest method to bring capacity online, the facility itself is often the gating item on the schedule. Is this a brownfield (existing) facility, facility refurbishment, or a greenfield (new construction)?

It is not uncommon for a building to be under construction or significant renovation while equipment is designed and fabricated off-site. That being said, **stick-building** doesn't provide an advantage under this scenario. The building construction or renovation can take place in parallel with the design and construction of the physical equipment off-site at a supplier's factory, which is how most projects are executed today.

In some cases, accessing the interior of an existing facility may be limited or impractical. When renovating, there might be instances where introducing large skids is unfeasible due to existing infrastructure and operational areas, rendering modular construction an unlikely choice. It's quite standard for companies to assess the rigging route to identify size limitations, subsequently considering the modularization of subassemblies. Using these identified size constraints, designs can be tailored to factor in shipping and rigging breakpoints, thereby enabling a degree of pre-fabrication that minimizes onsite wiring and piping.

Cost

It's generally accepted knowledge that it is more expensive to perform work in the field than it is in a controlled manufacturing environment, but it's not always clear why the cost is higher and what the actual delta is between field build and factory building.

Construction of current Good Manufacturing Practice (cGMP) pharmaceutical facilities **requires some very specialized skill sets that may not be in abundance in the area where the facility is being built.** This usually means tradespeople travel to the site for extended periods of time to complete the work. This requires travel costs such as transportation, lodging, and per diem. The resultant "inclusive" hourly rate (labor rate plus expenses) usually exceeds 150% of the typically burdened labor cost in a factory setting. This is only further exacerbated by the cost of shipping specialized tools and equipment rentals, such as cranes and fork trucks, that are readily available at the typical factory.

These additional costs are further compounded by the generally lower efficiency experienced by field operations. Challenges include:

- ✓ Waiting on access to a space that is occupied by another vendor/trade to complete work.
- ✓ Setup and safety hazards inherent in working in different parts of a facility, versus short travel distances around a stationary skid on a factory floor.
- ✓ Time spent retrieving materials from a secured locker or shed at a site versus kitted inventory delivered directly to the shop floor.
- ✓ Some field fabrication requires a controlled environment, which may not always be available adjacent to the work area. This requires additional time to move from a fabrication area to the installation area within the same facility.
- ✓ For hot work, a fire watch is often required while the work is being performed and after the work is completed. This adds a logistical challenge and additional manpower that isn't necessary in a factory setting.

While each trade is impacted differently by these challenges, the inefficiencies will vary, but **it is generally accepted that field construction will reduce the productivity of the activity.** Depending on which specific challenges that are encountered (which can vary significantly from site to site and trade to trade), that could be as little as 10% and upward of 50 or 60%.

Schedule

Recently many companies have been questioning whether stick-building can reduce the timeline of a project by having components/materials drop-shipped to the site and assembled “on the fly”. Besides the obvious challenges associated with coordinating materials at a site not accustomed to large inventories, it has been noted that this often leads to extensive delays and costs related to improper inspections, lost documentation, and ineffective kitting of materials.

At a manufacturer's facility, all the necessary infrastructure required to efficiently move material through receipt, inspection, documentation gathering and ultimately kitting for assembly will be in place. Fabrication and assembly personnel have ready access to their tools and all necessary equipment required to move/handle materials (cranes, fork trucks, pallet jacks, etc.). The environment in the factory is more closely controlled and meets the requirements of the associated work (i.e. temperature, humidity, fire suppression, etc.).

AT A MANUFACTURER'S FACILITY, ALL THE NECESSARY INFRASTRUCTURE REQUIRED TO EFFICIENTLY

RECEIVE	INSPECT	GATHER DOCUMENTATION	KIT FOR ASSEMBLY

Not to be forgotten, Mother Nature has her own say in project success. Depending on the state of the facility and where work areas have been designated, weather can have a major impact on production. If set up outside (or under work tents), workers are required (by OSHA) to seek shelter when a) there are high winds (e.g., >30 MPH if operating material handling > 40 MPH otherwise) and b) at the first sound of thunder/sight of lightening for a pre-determined period of time (e.g., 30 minutes after last sound/sight) as defined by their Emergency Action Plan. In some locations, during certain times of the year, this could be a daily activity that costs an hour or two per person/per day. While not a major impact on most projects, it just highlights one of the multitude of variables that can impact productivity when not in a controlled manufacturing environment.

Safety

No discussion around work practices can ignore the safety discussion as the industry's top priority. I was tempted to lead the discussion on this topic with the safety discussion as it is always the highest priority, but I didn't want to dismiss the discussion of methods or approaches before it even started. While construction occupations rank 2nd highest among workplace fatalities (Bureau of Labor Statistics "NATIONAL CENSUS OF FATAL OCCUPATIONAL INJURIES IN 2021"), these jobs can be, and are, safe when proper precautions are taken.

Construction sites are highly dynamic work environments with a multitude of disciplines competing for space and access against aggressive schedules. By its very nature, the workplace has many variables from site to site with large material movements and temporary workspaces. This lack of uniformity, and temporary work conditions, lend themselves to more risks for workers.

That said, construction-related work is never going to be eliminated.

The safety goal should always be to reduce the potential hazards and one method is to limit the complexity of activities and hazards at the site. **COMPLETING AS MUCH WORK AS POSSIBLE OFF-SITE, WHERE THE WORK ENVIRONMENT CAN BE CLOSELY CONTROLLED**, is one method to reduce field complexity and hazards.

When to Stick Build

One might assume that Super Skidding is the only way to execute projects based on cost, schedule, and safety topics, but that isn't the case. Understand that all projects tend to utilize methods of both approaches. **It is a rare occurrence that any process line can be 100% configured and supplied "plug and play", some level of on-site integration always exists.** While design and manufacturing tools can provide precision equipment, there are still slight variations in stack-up and tolerances that exist when integrating skids from one operation to the next, particularly when those skids are supplied by different vendors.

Project retrofits also lend themselves to this method as well. Frequently a staggered implementation of changes within a project makes modular construction more challenging. In such cases, exact dimensions or existing facility constraints of the old installation require some level of "game day" decision-making when routing piping/wiring after demolition and removal of existing equipment.

The choice between Super Skidding and Stick Building is not a one-size-fits-all decision. It depends on various factors such as project complexity, budget, timeline constraints, site location/access, and regulatory considerations.

Choosing the Right Approach: Context Matters

IN CONCLUSION, both Super Skidding and Stick Building offer unique advantages and challenges. While **Super Skidding excels in expediting construction and minimizing disruptions, Stick Building offers greater design flexibility and site specificity.** The key is to analyze project requirements carefully and select the approach that aligns with the project's schedule, budget and constraints.

In the dynamic realm of pharmaceutical facility projects, the ongoing debate between Super Skidding and Stick Building underscores the industry's commitment to innovation and efficiency.

As technologies and construction methodologies continue to evolve, pharmaceutical companies can leverage these options to leverage state-of-the-art facilities that drive progress in drug development and manufacturing.

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