



Rittal White Paper 103: The Practical Benefits of Modular Industrial Enclosures

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Executive Summary

Modular freestanding enclosures offer a number of key advantages when compared to traditional unibody enclosures. Many times these attributes are overlooked either out of a false perception of increased enclosure costs, a reluctance to change or a simple lack of awareness to the possible benefits of modular solutions.

This white paper seeks to provide a clearer understanding, for both integrators and end users alike, of the benefits offered by modular enclosures and by doing so, demonstrate the savings that can be realized over the lifespan of an enclosure after factoring in common use and operating costs such as maintenance, modifications and expansions associated with typical industrial applications.

True Cost

Most people are familiar with the concept of ROI (Return On Investment). Considering the savings or possible yields of a decision beyond the initial cost is a wise course of action in any business. For the purposes of this paper, a variation of this concept will be employed which will be referred to as “true cost.” True cost is simply totaling the costs of an enclosure solution over the course of its lifecycle via practical examples, and is represented by the short equation below.

$$\text{Acquisition Cost} + \text{Use Costs} + \text{Operating Costs} = \text{True Cost}$$

Acquisition costs are realities for control panel shops, integrators and end users alike. After the initial purchase decision is made however, panel shops and integrators are more likely to be concerned with use costs while a significant portion of the true cost for end users will come from operating costs. Use costs are mostly attributed to labor and the use of floor space during integration while operating costs generally include labor for maintenance, lost productivity due to downtime and costs incurred during expansion. The inherent advantages of modular enclosures can substantially reduce all of these costs.

Use Costs

In integration and panel shops, time and floor space are always at a premium. The more labor that is needed to perform and complete a task, and the more space it requires, the less efficient the processes of the entire business become. This translates to lower productivity and, as a result, less profitability.

Use Cost—Door Removal

Human machine interface components require modifications to be made to the doors of industrial control enclosures. Traditional unibody cabinets use a continuous (piano) hinge for the door. Removal and installation of a door with this type of hinge can take up to 30 minutes. For this reason, most integrators choose to leave the door in place and perform cutouts while the enclosure is on its back—taking up valuable floor space and in many cases, incurring additional labor costs involved in tilting the enclosure on its back including the possible use of cranes or forklifts. When cutouts are done this way, it is very common for the metal shavings created by the cutout to fall into the enclosure—requiring a thorough cleaning to remove and adding even more labor costs to the process.

Conversely, the doors of a modular enclosure are attached by multi-point, captive hinges and can be removed in as little as 30 seconds (over 98% faster than piano-hinged doors) and taken to a separate location for modification. The costs associated with properly positioning a unibody enclosure for door modifications are completely eliminated and as an added benefit, work can be performed inside the enclosure at the same time as the cutouts are being made to the door resulting in increased productivity.

Use Cost—Adding Cutouts

The time and cost benefits of performing cutouts at a separate location do not end with the door. With a truly modular enclosure, all of the skins including the sidewalls and roof are removable as well. Since it is very common for enclosures to be modified to accommodate, among other things, some type of component cooling solution such as fans, heat exchangers or air conditioners, the ability to simply remove the mounting surface for modification is a tremendous

advantage. As with the door, performing cutouts on the other surfaces of unibody cabinets uses valuable floor space, requires cleaning and often, additional time and labor to stage the enclosure with forklifts or cranes.

Beyond the logistical and labor benefits that modular enclosures provide when adding cutouts, the tools use to create the cutouts benefit as well. Unlike unibody cabinets, the strength of modular enclosures comes from the frame and not the skins. This difference is beneficial because, with average steel thicknesses of 10-12 gauge for unibody and 14-16 gauge for modular enclosures, performing cutouts to the skins of modular enclosures is easier on the tools used to make them—increasing tool life and thereby decreasing tool maintenance and replacement costs.

Use Cost—Mounting Panel Removal and Replacement

Mounting panel removal and replacement in a unibody cabinet can require extensive labor and machine costs. A crane or forklift is needed to put the enclosure on its back, remove the panel for equipment installation, drop it back in over the studs and then raise the enclosure back to its upright position. In the case that multiple enclosures and panels are needed for a project, the enclosures must be staged due to limited crane availability, monopolizing valuable floor space that could be used for other jobs.

Mounting panels customarily found in modular enclosures are full-size (in relation to the size of the enclosure), depth-adjustable and easily slide in and out of the enclosure. In addition to the benefit of easily adjusting the mounting panel depth, use cost savings include the labor to install panels (panels slide in and out) without the need for staging and craning, and the elimination of additional required floor space.

Use Cost—Weight

Because of their thick 10-12 gauge steel construction, unibody cabinets weigh considerably more than their modular counterparts. Without sacrificing strength or protection, modular enclosures are lighter and thus easier to transport around the shop floor and cheaper to ship—resulting in significant savings of time and freight. Typically, weight savings for modular enclosures are 75-175 lb for single door and 300 lb for double door configurations when compared to unibody equivalents.

Operating Costs

End users can benefit from use costs as well, however, it is easier to demonstrate the benefits of using modular enclosures when viewed from the perspective of saved operating costs. Savings include labor for maintenance, more productivity due to decreased downtime and easier expansion capabilities.

Operating Cost—Maintenance

Scheduled maintenance on machines and control panels is necessary to keep operations running smoothly. Unscheduled maintenance, on the other hand, can cost a company millions of dollars in lost productivity. The flexibility of modular enclosures makes them easier to maintain and limits users' exposure to unplanned downtime. Doors, walls and roofs can all be removed within minutes of an occurrence allowing for easier access to installed equipment and simplifying what can be very labor intensive processes with unibody enclosures—even under planned conditions. And since mounting panels easily slide out of the front of modular enclosures, the panel can be removed without time-consuming enclosure staging.

In the event that an accident damages a modular enclosure, often times, the affected enclosure surface (sidewall, door(s) or roof) can simply be replaced. Unibody cabinets do not provide this flexibility. At a minimum, all of the components will need to be removed from the cabinet and repairs made by cutting out the damaged surface(s) and welding new sheet metal in its (their) place. If enough damage has occurred, the entire cabinet may need to be scrapped.

Operating Cost—Expansion

A factory floor is a dynamic environment where needs can frequently change. If the control panel in a unibody cabinet is full and additional equipment needs to be installed, a new, larger enclosure is usually required. With this comes the removal and reinstallation of existing components to the new panel. Conversely, if a similar need to expand the capacity of a control panel arises while using a modular enclosure, multiple options exist to quickly and easily install new equipment to complete the expansion. Solutions include installing partial mounting panels, chassis bars, or 19" rails. These options are standard accessories for most modular enclosures that seamlessly integrate into the existing cabinet.

In the case that an expansion plan exceeds the size of the existing enclosure but requires that the added equipment be housed with the previous components, the difference between modular and unibody enclosures is also clear. Using a unibody cabinet under these circumstances, like in the previous panel example, a completely new and larger enclosure would need to be used—populated with both the new equipment and the existing components that have been removed from the prior cabinet. In this same situation, using a modular enclosure solution, it is possible to expand the original enclosure by simply joining another enclosure to it. Because all of the walls of modular enclosures can be quickly removed, enclosures can easily be bayed together in nearly infinite configurations to accommodate expansion—front-to-back, side-to-side and so on. This flexibility saves time, money and frustration because it allows end users to adapt their current installations to suit new needs instead of starting over from scratch as required with unibody cabinets. Modular bayed suites can grow to be as large as needed over time or even scaled back if necessary—offering levels of convenience and customization not available with unibody cabinets.

Conclusions

Despite a number of functional and financial advantages offered by modular enclosures as compared to unibody cabinets, portions of the industry continue to adopt a somewhat shortsighted focus based solely on acquisition cost, and in some cases, the mistaken notion that modular enclosures are inherently more expensive. When specifications for control panels and other applications are written, the true costs and benefits of utilizing one enclosure solution over another must be fully considered—especially in today’s economic climate where every penny counts.

While in some cases choosing a unibody cabinet might seem to be a more cost effective course of action at first glance, once the use and operations costs are factored into the equation, a unibody solution may prove to be cost-prohibitive. Because the lifecycle of a typical industrial enclosure is filled with planned and unplanned changes and/or repairs, using a modular platform can limit exposure to risks associated with additional costs and downtime—often making a modular enclosure the most sensible choice. Modular enclosures provide the protection required for industrial drives, controls and other equipment along with the practical flexibility to evolve with the changing demands of modern business—all while saving time and money over the course of their lifecycles.

About the Author

Nathan Xavier is a Rittal Corporation Applications Engineer and has been with the company since 2007. He holds a Bachelor of Science degree in Mechanical Engineering and provides product management and customer-specific applications support relating to Rittal industrial enclosure and power distribution solutions.