Your Guide to Buying an Industrial-grade Computer Chassis

More than Just a Metal Housing

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To most users, an industrial PC case is just a sheet-metal housing that protects the PC innards from environmental exposure. Most cases or chassis are merely functional to the working of the computer while keeping out dust. Price therefore is a priority when users are in the market for chassis. Understandably, most users go for cheaper, serviceable chassis, as most consumer PCs are used for non-mission-critical document processing and web browsing, for which breakdowns aren't a big issue. In industrial computing however, system stability takes precedence above all else – everything has to correct to ensure reliable operation. In light of such criteria, industrial-grade computer chassis require designs of a completely different class to accommodate mission-critical applications.

A computer chassis has to protect against several properties: dust, shock, vibration, and overheating. More advanced features include electromagnetic shielding, scalability, and the ability to modify the case. Basic functions would more than suffice for commercial use, due to the lower operational and performance demands, and fixed specification requirements. Yet in industrial applications, system reliability and flexible system design take priority over other considerations.

All in all, four differences can be summed up between consumer/commercial and industrial-grade chassis. These differences involve scalability, maintenance, applications, and product longevity.

Four differences between consumer/commercial and industrial-grade chassis

Scalability

With regard to scalability, commercial computers have a fixed range of operational requirements and rarely call for much adjustment after they leave the factory. And because of the invariable specification design, the chassis have very little room for further expansion options. Industrial computers on the other hand require constant operation and system specification adjustments to adapt to different purposes. Industrial mainboards come in a myriad of form factors, such as ATX / MicroATX / Mini-ITX motherboards or full-size / half-size single board computers (SBCs), and the expansion slots on either motherboards or backplanes are manifold. If expansion slots are not reserved in advance, chances are the chassis will need replacements somewhere down the road, and system configurations will need to be redesigned to accommodate new demands. The costs incurred will far surpass the money originally saved on expansion slots.

Maintenance

Secondly, ease of maintenance may not seem as important as other requirements. Nowadays most commercial chassis open via a plain side cover, but this model is obviously insufficient to meet industrial applications. The innards of industrial chassis are designed

differently, and the installation placement may also vary at different facilities so flexible top/side cover designs are necessary. As a result models including L-shaped and U-shaped top covers have been developed in addition to the traditional plain side versions. Other serviceability elements may be included in design details that ensure convenient operation and maintenance by users or operators, such as tool-free thumb screws and easy-carry handles.

Applications

Thirdly, industrial chassis are used in harsh environments, such as hot boiler rooms, sub-zero cold stores, as well as dusty and vibrating environments. Reliable system operation in these places is facilitated by good system design, and since system failures often result in high costs, systems must be very reliable under every possible operating condition. Wide temperature support is common in industrial computing applications, ranging from the extremes of -10 to 50º C. In addition, industrial computers must provide shock and dust protection. Some systems must withstand environment-induced high vibration, and resonances generated by system-embedded hard discs and fans. Fanless systems are becoming popular, too, offering stable, silent, low maintenance solutions. Fanless designs dissipate heat via specially-designed heat sinks, heat pipes, or even the aluminum chassis itself.

Product Longevity

Product lifespan and extended supply guarantee are two other elements that should be considered. Commercial computers can function well for a few years on average. Industrial computers, however, are mostly applied in production lines and vertical industries as operation controllers, where component replacements aren't always possible or even practical; therefore it's reasonable to expect three to five years of life expectancy from industrial computers. So when looking to purchase industrial computers or chassis, look for well known companies with international component suppliers to ensure quality and the longest possible lifespan. Additionally, make sure the providers offer extended, uninterrupted product supply to avoid problems during periodic system renewals.

Follow these principles and choose quality, industrial-grade chassis by following these rules:

Step 1, Operating Conditions

Industrial computers have evolved from their previous exclusive assignments to meet diverse vertical market applications, such as medical, financial, and communications. With that in mind, the environments in which industrial computers operate have also changed accordingly. Here, location rather than performance driven considerations are important. For chassis operating next to metallurgic boilers, one needs to think about temperature issues; and for those operating in shock-ridden, dust-filled, heavy industries, chassis with thick housings and special dustproof protection are needed. Advantech's chassis housing is 1.2 millimeters thick

and has hot-swap dual cooling fans. And industrial computers require a motherboard / SBC and chassis that conform to specific stringent operating requirements. If customers choose only performance based components, instead of industrial-grade, the whole system could be compromised, and the loss greater than system itself. Therefore it's vital for users to take into account the specific application location and select an appropriate chassis to suit.

Step 2, Space Limitations

Different application locales require different chassis form factors and sizes. Embedded, desktop/wallmount and rackmount models have been developed to meet different application demands. Various sizes ranging from 1U to 7U are available, depending on the required system functions and the space limitations.

Step 3, Main Board Selections

CPU cards for industrial computers come in a great variety of form factors, such as full-size / half-size SBCs and ATX / MicroATX / Mini-ITX motherboards. Different CPU cards or motherboards may support different numbers of expansion slots. Each industrial motherboard or CPU card together with the selected backplane may have one or more possible choices of industrial chassis. Users are advised to consult a professional system integrator or industrial computer supplier to find a suitable chassis when considering system designs. In selecting a mainboard, be sure to factor in scalability options for the future. System upgrades occasioned by operation workflow modifications are commonplace in the IPC sector; thus slots for future system expansion should be built into the chassis. One must also carefully think over cost concerns at this point. An industrial chassis costs about twice as much as a commercial chassis. Some users therefore select non-industrial-grade models, or find a fabricator to make a slapdash chassis formed of steel plate. While money is saved initially, hazard risks increase as industrial computing systems are thrust into - and operate in - non-functional locales. Advantech is no stranger to clients who have suffered system breakdowns caused by cutting corners and using non-professional chassis, only to pay a much higher price for maintenance afterwards. It is worth a slightly higher price tag to ensure that the overall system stability is improved.

Step 4, Comprehensive System Integration

There are two additional concerns when considering system integration, one is the overall cable arrangement, the other is power supply selections. Industrial computers differ from commercial PCs in that the systems are much more complex, and cable arrangements have to be streamlined to firstly: cut down system intricacies, and secondly: to facilitate maintenance work. Most important of all is to arrange interior cable streamlining so that it assists the process of ventilation and promotes heat dispersion. This brings us to the second concern: power sources are often overlooked, because power supply in commercial chassis are fixed, so consumers hardly pay attention to power consumption. They pick chassis models with a wattage gauge that they're most comfortable with and worry about problems later. This gives rise to two issues: one is that the power usage in chassis on the market has

risen over the years and can lead to a staggering electricity bill; the other is that insufficient power may also create system failures, leading to higher maintenance bills. To prevent this, one has to work out the total wattage needed to run the system, or consult a trusted IPC supplier in advance to keep power costs in check.

Step 5, Maintenance

When looking for a chassis, one should also consider follow-up maintenance support. The support items should include periodic system monitoring functions, alert mechanisms, and serviceability. The alert mechanism serves to help the user quickly understand the system's inner workings. In addition to the general power source and hard drive LED indicators, Advantech chassis have a temperature sensor and fan speed sensor that shows the status via LED indicators on the chassis front panel. An operator can quickly assess the system condition through the LED indicators and act accordingly. Advantech chassis are also noted for their expedient maintenance support. The thumb screw is affixed outside the hole to prevent its misplacement during maintenance. Other components, including fans or filters, are modularized and can be replaced quickly.

Step 6, System Verification

Because Industrial computers are extensively integrated in a range of control applications, certification criteria are much more stringent than commercial computers. Shock, vibration, wide temperature range, and electromagnetic radiation levels are tested by different certification mechanisms. In general, a chassis undergoes a three-level verification process within the IPC provider's confirmation system. A preliminary specification test is run at room temperature, much like the test for commercial computers. The purpose of the test is to see if the machine runs smoothly under normal operating circumstances. The next round of tests, including extreme temperatures, shock and vibration, is conducted in the lab to see if the product runs steadily under harsh conditions. The final check is done in a real industrial environment for local micro-adjustments and specification confirmation. After passing these tests, the manufacturer can now apply for a system security verification exam for the product. Presently, countries around the world have implemented rigorous safety regulations for industrial facilities, and before being certified with a clean bill of health, the system integrator must take all these aspects into consideration when integrating an internal system with a chassis fixture.

The chassis is easily the most conspicuous – yet the most often ignored – component in the whole system. Nevertheless, the quality of chassis can make or break a system's long-term stability. Hence, a specialty chassis made by a trusted IPC provider can be trusted to safeguard system stability. As a reputable company in the IPC field, Advantech delivers what its logo promises.

In addition to a professional task force for designing chassis models, Advantech runs a plant for producing industrial chassis, with more than 200 models available to meet any industrial demands. For instance, most chassis manufacturers paint the whole chassis for anti-oxidation treatment, but most customers are misinformed. As effective as painting is for anti-oxidation, it obstructs a chassis' grounding capacities. Therefore, a chassis

housing's crooks, angles, and rivets should be left unfinished to effectively prevent electromagnetic disturbances. Additionally, the bottom of the chassis housing isn't the only place that needs to be padded with shockproof material, the hard drive also requires shock proofing. Furthermore, the natural frequencies of these two shock proofed zones should be protected from each other so as to avoid resonance; they ought to damp each other out. This type of expertise is picked up along the way through lots of trial and error. Advantech has benefited from this expertise to solidify its status in the chassis manufacturing sector.

Advantech's main strength is in service. In addition to designing a diversity of chassis, Advantech's task force provides customization support, with its own factories, production lines, and more than thirty branch offices around the world. From the initial design, to production, to product delivery, Advantech customers enjoy seamless service to cut back time-to-market. Moreover, Advantech capitalizes on its comprehensive production line strengths to offer CTOS (Configure To Order Services). In other words, Advantech provides clients with a set of custom systems, complemented by its own products, to conduct the entire chassis verification system in the company's own lab. Solution Integration Services (SIS) are another plus for clients – the solutions promise a total package of system integration support, assuring that the clients obtain extended, quality chassis products and assistance at any time.

IPC-5120
Wallmount Chassis

ACP-4320
4U Rackmount Chassis

ACP-1320
1U Rackmount Chassis

IPC-6025
5-slot Wallmount Chassis

ARK-6310
Compact Embedded Chassis

EBPC-3500
Embedded Industrial Chassis

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