Ticket machine safely packaged

Cost-optimized case thanks to state-of-the-art manufacturing

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Whether used indoors or outdoors, vending machines carry special demands on electronic packaging technology, e.g. high shock tolerance and protection against vandalism. Complex metal construction using sheet metal bending, welding and casting technologies are often deployed. With the aid of an intelligent material mix and state-of-the-art manufacturing the POLYRACK TECH-GROUP has developed an extremely cost-effective case solution for ticket machines.

Init GmbH was on the search for a reliable, integrated case solution to safely "package" an electronic reading and testing device intended for ticket control in public transport. The specifications were set as follows: extremely robust for shock protection (e.g. due to uneven track or in road traffic) and plenty of scope for the rational integration of electronic components and fiber optics. In addition the case had to protect the electronics at temperatures ranging from -30 to +80°C, be vandal-proof and compliant with IP54 (indoors) and IP65 (outdoors). In order to offer the passengers an easy handling and a high usability, the machines had to be of modern, configurable design. A customized color design in line with the company's corporate identity as well as the place of installation completed the requirement profile. As the production was planned for small to medium quantities, not only the technical design but especially the cost-effectiveness of the packaging solution played a decisive role.

Partner for comprehensive solutions

In their quest for a manufacturer with a tremendous production depth and vertical range of manufacturing at its disposal, Init opted for the specialists at POLYRACK TECH-GROUP, based on the many years of good collaboration. As a Supplier for the entire range of technologies - from mechanical manufacturing through systems engineering, electronics and plastics technology to surface treatment, the packaging specialist is able to pull out all the stops when creating top-quality, customer-specific case solutions. Hence nothing was excluded from the beginning of the development phase of the ticket machine. The experts at POLYRACK investigated across technologies which material, which design and which

manufacturing technique could meet the entire requirements in the best and most cost-effective manner.

Unlimited design scope thanks to material mix

The material that was finally recommended was a combination of thermoplastic and metal. Thanks to the high design scope of plastic in regards to shaping, color, surface finishing and execution, customized cases with a high recognition factor can be manufactured in small and large quantities. Plastic is the material of choice, particularly in combination with metal. In the process plastic solutions are not equivalent to a loss of robustness. Depending on the application, the materials contain additives such as glass fibers for strength enhancement, stabilizers for weathering resistance (UV, heat, aging) and flame retardants to reduce flammability. For projects like this POLYRACK has recourse to the sound know-how and experience of RAPP Kunststofftechnik (Plastics Technology). The plastic specialists are well acquainted with every single material and every single technique.

The selection of the appropriate manufacturing technology was the next important decision to be made. Therefor the team evaluated a whole range of processing techniques. The expertise of the packaging manufacturer ranges from injection molding, foaming, printing, painting, milling to ultrasonic welding. Straight away it was clear that only three main technologies came into question for the combination with metal parts: aluminum die-casting, compact injection molding and structural foam molding.
POLYRACK simulated all three procedures to determine the best method in regards to constructional idea and economic viability: While aluminum die-casting scored high on account of dimensional accuracy and surface quality, it revealed its limitations when confronted with the display surface and the strict tolerances. Material flow analysis, midget boreholes and surface density resulted in considerable rework and hence high costs. Neither did compact injection molding deliver satisfactory results in this case. The design of the honeycombed wall structure of the ticket machine case and the various wall thicknesses proved to be too complex and expensive both in production and in mold construction.

Structural foam molding process for high stability

The manufacturer and the customer mutually opted for manufacturing with structural foam molding. This special technique is ideal for producing ambitious technical formed parts and at the same time achieving high case stability. The dreaded “sink marks” can occur with compact

injection molding can be avoided with structural foam molding. This enabled the design engineers to create different kinds of sink-free wall thicknesses ranging from 5 to 8 mm as well as various movements in thickness, domes and rib patterns. The usage of foaming agents allows the structural foam molding to shape the peripheral zone pore-free and create the inner core of the material cellular. Even in the event of material accumulation sink marks do not occur. This makes the case very strong and sturdy, extremely robust and vandal-proof. The weight of the case is reduced without any loss of stability thanks to the manufacturing technique, so that there is no reason not to use the ticket machines in mobile vehicles and buses.

The integrated packaging solution leaves enough space in the interior of the ticket machine for the integration of electronic and other components such as loudspeaker or fiber optics. These can be fitted with a minimum amount of effort using quick assembly. Inserts are provided for statically relevant parts or components to enhance service performance. A sealing groove for dispensing is also integrated. The operator will find a glass panel in the front to accommodate the display. It is adhered elastically so that it remains secure even when the various materials expand. For surface finishing the customer had a whole array of coatings and varnishes to choose from, such as two-part varnish, UV-resistant varnishes or anti-graphite varnish. Various metal components enabled a simple installation of the ticket machines in the vehicles - either on a tube, mast or by way of wall-mounting.

Cost savings in manufacturing and mold construction

In addition to the constructional benefits, the structural foam molding process enables cost efficient production of cases in medium to high quantities. The holding pressure is lower compared to compact injection molding, resulting in less robust tools in the mold construction and cost savings. The use of smaller types of machines also had a positive effect on the part price. The reduced sink marks in the event of material accumulation ensure optimized varnishing, and avoid additional expense.

With regard to the economic aspects the ticket machine conforms to all requirements of a robust packaging solution. This example illustrates how POLYRACK was able to create a technically mature, customized packaging solution from concept to industrialization and all the way into serial production, thanks to the close dialog with the customer. Init GmbH was very satisfied with the project progression and accomplishment. The supplier is particularly pleased with this exclusive, provocative product that is not available off the shelf.

Images:

Picture1: During transport, the POLYRACK packaging reliably protects the electronic ticket reader from shock and vibration.

Picture2: Thanks to the intelligent material mix, customized cases with a high recognition factor can be produced cost effectively.

Picture3: "When developing the packaging for the ticket machine, POLYRACK had recourse to all manufacturing techniques and materials across a whole range of technologies."