CASE STUDY

JÄGER GROUP PROVIDES ENERGY

OUR INGENIOUS SEALING SYSTEM FOR THE INSTALLATION IN THE INVERTER

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CHALLENGE

Sophisticated condenser seal for **all climatic conditions**

Easy installation of **18 capacitors** required **at the same time**

Material must meet **fire protection guidelines**

SOLUTION

Correct choice of materials and joint testing

Adding a **clamping ring to the seal**

Creation of an **injection mold**

RESULT

Reliable seal suitable for electronics production

Simple installation of capacitors in the inverter

Seal with a **service life** of at **least 20 years**

EASILY MOUNTABLE SEAL FOR INVERTERS WANTED

SMA Solar Technology AG, a producer in the solar industry, is turning to Jäger Gummi und Kunststoff with a power inverter project. The assembly of capacitors using a self-developed seal with a molded part made of silicone has proven to be too complex, too expensive and with risks for the required tightness. Therefore, SMA Solar Technology is looking for a solution for a simple installation of 18 capacitors simultaneously.

Jäger Gummi und Kunststoff is the right address for this. The engineers and designers prepare FEM calculations to calculate the deformations and required pre-stressing of the seal and then manufacture a steel test mold to provide the customer with test seals made of original material for trials.

In doing so, the customer's developers, together with Jäger's experts, record exactly where problems still occur in the endurance test. How does the designed gasket behave under different assembly processes and sealing requirements (stresses, temperature differences, expansion behavior, etc.)? The advantages and disadvantages are discussed together and a seal geometry is decided upon.

The developers test the newly created sample gaskets: To do this, they subject the test part to a tightness test (immersion test) overnight and then analyze the exact location and extent of the leakage. Throughout the entire process, all those involved come together again and again. All steps are checked, recorded and new proposals are developed.

CHALLENGE

REQUIREMENT PROFILE MUST BE CONVINCING WORLDWIDE

The requirement profile is extensive: the capacitor should be firmly seated in the mounting plate. In addition, the seal must allow exact movement tolerances. Since the inverters are in demand worldwide, very different climatic conditions must be expected. For example, no earth moisture or air humidity may reach the capacitors or the electronics area in the inverter; this could cause damage. For this reason, Jäger's seal must seal both to the metal sheet and to the individual capacitors.

In addition, the selected material must comply with fire protection guidelines. In this case the US American fire standard UL 94 HB applies. This defines the maximum length of time this seal may burn in the event of a fire. This is based on the relative temperature index of 110 degrees Celsius.

Another point: How can the seal between the sheet metal and the capacitor be optimally inserted? The tests quickly show that the seal cannot be anchored in the sheet metal without an additional clamping ring. But how must this ring be designed so that it sits firmly and securely in the sheet metal opening?

SOLUTION

MULTI-PART CAPACITOR SET FOR SMOOTH INSTALLATION

The right choice of material and design is decisive for both the seal and the clamping ring. In addition to the matched silicone compound, POM with glass fibre content is used for the clamping ring. Initial clamping ring prototypes can be produced by a mechanical production process and must be designed for a later planned injection molding and assembly process. It is a particular challenge to design the clamping ring in such a way that the required elasticity for the assembly process is given. The clamping rings must sit firmly in the sheet metal and press the seals against the sheet metal so that sufficient tightness is ensured. However, the clamping ring must not burst in the process.

In order to test the function of the original material and the design envisaged so far, an injection mold of one caliber must be made. To determine the final design of the clamping ring, tool change loops are necessary, all of which can be implemented with the existing tool.

Both products - the seal and the clamping ring - must ultimately allow the entire 18-piece capacitor set to be inserted smoothly in one step. Subsequent adjustment both vertically and horizontally should also be possible at the customer's request.

RESULT

LOW MAINTENANCE CONDENSER SEAL WITH CLAMPING RING

The placement of the capacitor in the seal is also carefully considered. In order to overcome the natural frictional resistance of the silicone, the engineers at Jäger Gummi und Kunststoff GmbH propose an assembly bonded coating. This also solves the last tricky question, because the installation of the capacitors in the inverter is done under the special conditions of electronics production. Suspended matter such as talcum, which is otherwise also used for this purpose, is eliminated. The bonded coating helps to overcome the resistance of the silicone without affecting its impermeability. The development costs are borne by both companies involved in a cooperative partnership.

The goal is achieved after six months: complete assembly of the seals including the clamping ring for the entire capacitor set. A durable and low-maintenance solution from Jäger!

Contact:
Robert Gurka
Jäger Gummi und Kunststoff GmbH
Bissendorfer Straße 6
30625 Hannover

Tel +49 511 - 5358 0
info@jaeger-gk.de
www.jaeger-gk.de

Are you interested in solar technology?
Please also visit our customer:
www.SMA.de