Press Release

Innovations for the aviation industry

New materials for fire-proof seals

Weinheim. Seals in engine nacelles must withstand the temperatures of more than 1,000°C. Until now, special, fabric-reinforced materials have been used in these applications. Freudenberg-NOK Sealing Technologies is now exploring notably lightweight reinforcements as well as fiber-less alternatives that make production more cost-effective.

Fortunately, engine fires are a rare occurrence in modern aviation. But when they occur, the seat of the fire must be contained within the body of the engine. Otherwise, the smoke could reach the cabin or the flames could even ignite the fuel carried in the wings. That is why safety authorities have prescribed at least 15 minutes as the timeframe for the seals in the engine nacelle to withstand the flames. In the process, temperatures can climb as high as 2,000°F (nearly 1,100°C). Even in normal operation, seals are exposed to high thermal stresses. To conserve fuel, modern engines have been employing increasingly high combustion chamber temperatures. The inner side of the engine casing is exposed to temperatures of up to 300°C while the air flowing on the outside can be as low as -65°C.

Aviation supplier Freudenberg-NOK Sealing Technologies is continually engaged in research on materials that offer the required temperature resistance on one hand, and are as light as possible to maximize the payload on the other hand. For these purposes the engineers at the sealing specialist continuously enhance the tried-and-tested fabric-reinforced materials. By utilizing low density reinforcement elements the weight of the seals can be reduced by up to 20 percent while maintaining a comparable functionality. These materials are already used in other areas of aircrafts. Now it is developed further in order to meet fire resistance and proof standards such as the ISO2685 standard utilizing kerosene.
Furthermore, engineers at Freudenberg NOK Sealing Technologies are testing a new silicone material for fire seals that can reduce or even eliminate fabric reinforcement altogether. When in the case of fire the surface of the silicone is exposed to direct flame contact, the material “ceramifies” and becomes a fire proof barrier. This surface barrier slows the progress of elastomer degradation underneath, caused by the direct flame. Since the layers of fabric can be reduced or even eliminated, there is a savings to raw material cost and the molding process is made simpler and thus the production of the seals is less expensive.

An average nacelle and thrust reverser ship set can contain over a hundred bespoke parts that Freudenberg-NOK Sealing Technologies fully designs and validates for the application. Fire Proof seals although rarely called upon for their full potential, can be some of the most challenging sealing areas in commercial aviation today. Therefore the specialists in Tillsonburg, Canada, work closely with engine manufacturers and nacelle providers to achieve the best possible mix of materials and design for this special area of application.

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About Freudenberg Sealing Technologies

Freudenberg Sealing Technologies is a supplier, development and service partner for customers in different market segments, such as the automotive industry, civil aviation, mechanical engineering, shipbuilding, food and pharmaceuticals, and agricultural and construction machinery.

Based on the Simmerring® which was developed by Freudenberg in 1929, Freudenberg Sealing Technologies has built up a broad and continuously expanding range of seals and vibration control technology products – from customized solutions to complete sealing packages. Together with its partners NOK Corporation, Japan, Sigma Freudenberg NOK, India and NOK-Freudenberg Group China, Freudenberg Sealing Technologies has formed a global network with the aim of offering products of the same high quality. The NOK-Freudenberg Group China is a 50:50 Joint Venture between the Japanese NOK Corporate and Freudenberg.

In addition, Schwab Vibration Control, Dichtomatik and Corteco fall under the Freudenberg Sealing Technologies umbrella. Schwab Vibration Control is a leading supplier of technology for vibration control components, wind energy solutions, agricultural and construction machinery and other industries. Dichtomatik is Freudenberg’s sales organization in the market for technical seals. Corteco is the Freudenberg Group specialist for the Independent Automotive Aftermarket specializing in spare parts for seals and vibration control as well as service parts such as cabin air filters.
As Freudenberg's largest Business Group, Freudenberg Sealing Technologies generated sales of more than € 2 billion in 2014 and employed some 15,000 people.

The company belongs to the Freudenberg Group which, with its Business Areas Seals and Vibration Control Technology, Nonwovens and Filtration, Household Products as well as Specialities and Others, generated sales of more than € 7 billion in 2014 (The 50:50 joint ventures are consolidated on a pro-rata basis) and employed approximately 40,000 associates in around 60 countries.