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'Sputter' Engine Bearings

High pressure turbocharging, intercooling/aftercooling and high pressure common fuel rail injection are just a few of the innovations in engine design and construction employed to increase engine horsepower and torque, while decreasing emissions and fuel consumption. These technologies result in significantly higher loads on all engine components, but especially the crankshaft and combustion chamber. KS Gleitlager GmbH, the plain bearing division of Kolbenschmidt Pierburg, claims, "In the period 1990 to 2005, the loads imposed on diesel engine connecting rod bearings will have risen by 37 percent, and by 33 percent in the case of the crankshaft bearings."

To support the increasing loads on engine bearings, manufacturers have developed and applied 'sputter' bearing technology. The sputtering process produces a highly uniform alloy matrix just a few thousandths of a millimetre thick on the plain bearing sliding surface. This ultrafine coating allows enormous load-bearing capability, significantly increased fatigue strength, lower wear rates in mixed friction operation and good corrosion resistance at elevated temperatures. Because sputtered bearings are significantly more expensive than ordinary bearings, they are used in engine areas subjected to the highest stresses. On conrod bearings the sputter bearing is usually installed as the top bearing shell, while on main bearings they are usually installed as the lower shell.

'Sputtering' is a physical vapour deposition (PVD) process whereby an aluminium-tin overlay is applied to the bearing surface. The bearings to be overlaid are placed in an evacuated chamber beneath an aluminium-tin alloy 'target'. The chamber is then charged with Argon gas which is electrically heated to a plasma-state. Federal-Mogul GLYCO explain the process as ion bombardment of the high-energy argon plasma dislodging aluminium and tin atoms from the source target, which are deposited on the bearings as a thin, highly uniform alloy coating (refer illustration below). The resulting overlay is an exceptionally uniform alloy matrix of aluminium-tin with an extremely fine distribution of tin. The overlay hardness is approximately 90HV, compared with 20 - 30 HV on electroplated overlaid bearings. The bearings have a very high load bearing strength (around 16000 psi), excellent corrosion and wear resistance, good embedability and very good resistance to overlay fatigue.

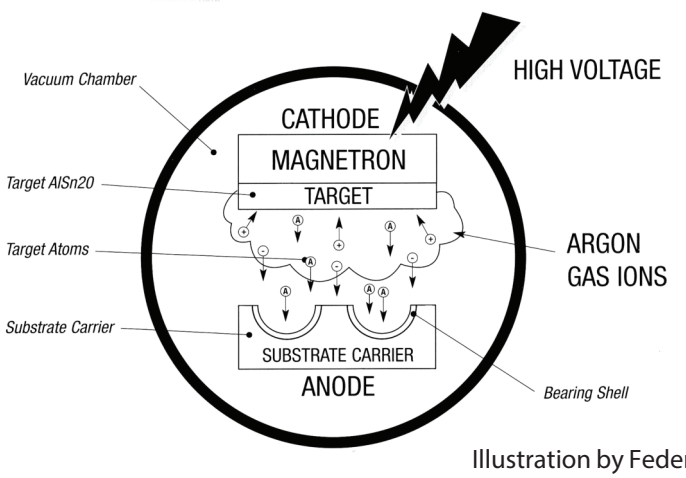

Illustration by Federal-Mogul GLYCO