

# Improved Exhaust Transition Piece for Avon GTs

by Hector Bourgeois & Jeff Phillips

The Rolls-Royce Avon gas turbine has been an extremely successful engine for many years, with over 2000 units sold. While many units have been in operation for more than 20 years, the exhaust transition piece can be a source of hot gas leakage and resulting power loss.

Located between the gas generator and power turbine, the transition piece forms a duct for the high-temperature (up to 650°C) exhaust gas produced by the gas generator. The OEM design, which has experienced severe hot gas leakage, uses piston rings at each end to form a seal, while also allowing the duct to accommodate thermal expansion and contraction by sliding.

However, both the transition duct and the gas generator exhaust frame often experience severe out-of-round creep distortions. Because the exhaust pressure is relatively low for piston rings, the rings cannot conform to the distortions, and considerable hot gas leakage can occur. This leakage not only causes a loss in power, but can also lead to overheating of the engine enclosure and deterioration of the nearby thermocouple harnesses, which are costly to replace.

Based on a request from one Avon owner, Fern Engineering, Inc. has de-

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*Fern Engineering has developed an improved design of the Avon gas turbine exhaust transition piece to eliminate hot gas leakage and resulting power loss.*

veloped a new design of the transition piece to solve this problem. Fern, based in Pocasset, Massachusetts, U.S.A., is an engineering consulting firm specializing in turbomachinery.

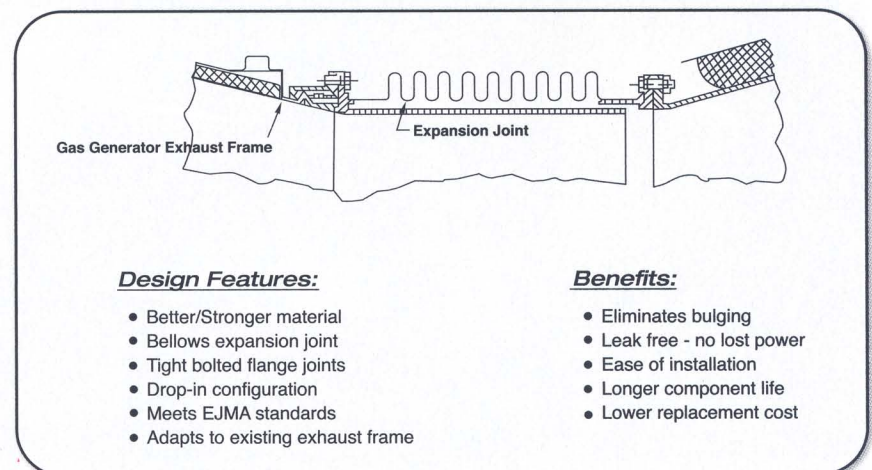
Fern's design features a bellows-type convolution section to accommodate thermal expansion and integral front and rear bolting flanges to ensure gas-tight sealing. The front of the duct is solidly bolted to an adapter flange mounted on the Avon exhaust frame, while the rear flange matches up with the existing power turbine flange. The design uses Inconel 625 LCF to better withstand the harsh operating conditions and to resist distortion and cycle fatigue.

Fern's first transition piece for the Avon was sold to Amerada Hess Cor-

poration, the New York, U.S.A.-based integrated petroleum company, in 1996 and is still in use after more than 40 000 hours of operation. Since 1996, over 20 other ducts have been sold to five different Avon owners.

Because the Avon gas generator has been packaged with power turbines from several different suppliers, Fern has developed flanges to match up to each kind of power turbine. Complete kits allow for "drop-in" installation without modifications to the gas generator or power turbine. Disassembly of the original ducts and replacement with the Fern design can be accomplished in two to three hours, without the need for specially trained maintenance personnel. ♣

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*Diagram shows features of improved Avon exhaust transition piece design.*