SHELL OIL TANKER "AURIS"

Master: Captain F. T. Vine — *Chief Engineer: A. N. V. Beedle*

THE FIRST MERCHANT SHIP TO BE PROPELLED BY A GAS TURBINE

Length 483 feet	Breadth 59ft. 2in.	Depth 34 feet
D.W. 12,250 tons	Speed 12 knots	B.H.P. 4,420

The "AURIS" was built and engined by Messrs. R. & W. Hawthorn Leslie & Co., Ltd., in accordance with plans and specifications prepared by The Anglo-Saxon Petroleum Co., Ltd.

When commissioned in April, 1948, the ship was provided with a diesel-electric propelling installation comprising four 8-cylinder 1,105 B.H.P. Hawthorn-Sulzer four-stroke cycle engines, each coupled to an alternator supplying current to a single electric motor driving the propeller.

This form of machinery installation was adopted for two reasons, the first being to experiment with the burning of boiler fuels in one of these high speed engines, and the second, to enable part only of the propelling installation to be replaced by a gas turbine then under construction at the Rugby Works of The British Thomson-Houston Co., Ltd.

As the gas turbine accounts for approximately 25 per cent. only of the total propelling power, the safety of the ship would not be materially affected, and the ship could continue trading, in the event of a breakdown. Moreover, this arrangement permits any irregularities that might occur in the gas turbine to be given closer attention than would be the case if an involuntary stop of the experimental unit meant that the ship became immobile.

To meet the limitations of space imposed by these requirements the various components of the gas turbine had to be arranged in such a way that the turbine would fit into the space available. Moreover, the turbine had to be kept well above the ship's double-bottom tank top in order to clear numerous pipes servicing the remainder of the propelling installation, while the heat exchanger could not be situated in the obvious position, i.e., inside the funnel.

In the operation of ships' propelling machinery the two chief factors are reliability and fuel economy. The latter can be calculated with reasonable accuracy but the degree of reliability can be determined only by testing under service conditions.

The sole purpose of installing a turbine of a power which could not be expected to give the highest possible thermal efficiency was, therefore, to obtain the measure of its reliability under sea conditions.

The gas turbine in the "AURIS" is of the simple open cycle type, designed for an initial gas temperature which ensures long life for the parts exposed to the peak temperature of the cycle.

The turbine is designed for an ambient air temperature of 68° F. (20° C.) and an H.P. turbine inlet temperature of 1,200° F. (650° C.). The designed speed of the H.P. turbine/compressor shaft is 6,000 R.P.M. and the L.P. turbine/alternator shaft 3,000 R.P.M. The power output is 1,200 B.H.P. at the L.P. turbine coupling or 860 Kw. at the alternator terminals.

The fuels so far used have a viscosity ranging from 50 to 1,500 secs. Redwood No. 1 at 100° F. From now onward the fuels to be used will have a viscosity of not less than 1,500 secs.

After installation of the gas turbine the "AURIS" left Hebburn-on-Tyne on the 28th October, 1951, for Port Arthur, Texas, and has since that date visited Curacao, Avonmouth, Swansea, Hull, Rotterdam, Oslo and Southampton for the purpose of loading or discharging cargo. The distance covered by the ship during this period totals 13,211 nautical miles, and the machinery has operated for 1,391 hours.

On no occasion was it necessary to stop the turbine at sea, nor had repairs to be effected at any of the ports visited. Routine inspections in accordance with a pre-arranged programme have been carried out without causing delay in sailing, and adjustments to the parts which affect the combustion efficiency have been made since the ship arrived at Avonmouth.

On the voyage Tyne, Port Arthur, Curacao, Avonmouth, the turbine operated on diesel fuel, and since leaving Hull boiler fuel of 1,500 secs. viscosity has been used. The fuel consumption has averaged 0.75lb. per B.H.P./hour, which is about the same as that of a steam turbine installation of equal rating.

The lubricating oil used during this period was 30 gallons, which represents a daily consumption of less than ¾ gallon. About 70 gallons of oil were lost owing to a defective pipe connection.

When boiler fuel is used it is first purified in the manner which has proved so successful in the case of diesel engines, i.e., the fuel is heated to 180° F. temperature and then passed through a centrifugal purifier and clarifier arranged in series. The fuel is injected into the turbine at 350lbs./sq. inch and at a temperature of 220° F.

Between the Tyne and Port Arthur exceptionally heavy weather was encountered on six days. The ship pitched and rolled and sea spray constantly swept the compressor air intake, but at no time did the turbine give cause for anxiety.

On the next Atlantic voyage the "AURIS" will be propelled solely by the gas turbine burning 1,500 secs. fuel.

From the results so far obtained in the "AURIS" it would appear that a new era in ship propulsion has been inaugurated. Much yet remains to be done before the gas turbine can be considered satisfactory in every respect but the present rate of progress leaves no doubt in the minds of the sponsors of this experiment that the day is not far off when the gas turbine will rival steam turbine and diesel installations in the matter of reliability and fuel economy, and surpass both in respect of maintenance costs.

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THE ANGLO-SAXON PETROLEUM COMPANY, LIMITED,
LONDON, E.C.3.
21st January, 1952