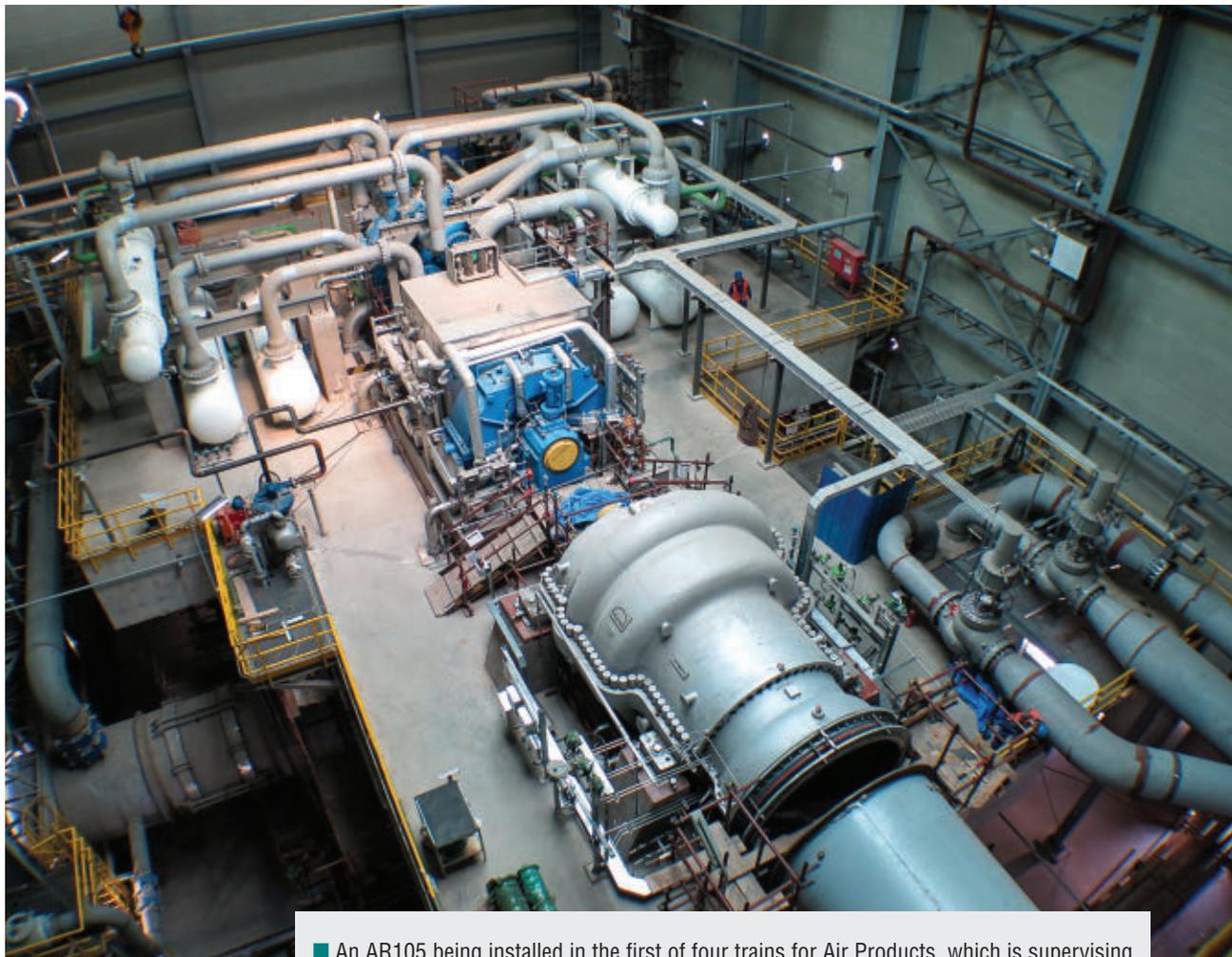


Compressors For Air Separation Units Prove Popular

> MAN streamlines testing, designs even larger machines

BY ROBERTO CHELLINI



■ An AR105 being installed in the first of four trains for Air Products, which is supervising a Yankuang coal plant project at Yulin, China.

MAN Diesel & Turbo (MDT) is reporting success in the sales of its AR-MAX1 air compressor line designed for large air separation units (ASU).

Since its introduction at the beginning of 2012, the compressor line has been selected by major ASU engineering companies such as Air Products, Linde and Hangyang for Chinese customers engaged in transforming coal into liquid fuels and chemical products.

The first order was for four of the “smallest” units, the AR105, which

have a nominal production of about 3300 tpd (3000 T/d) of oxygen. Two more orders followed, which included an order for 11 plants in the next size - the AR115 (3970 tpd [3600 T/d]) - and an order for three other AR105 units.

This success has prompted MDT to further invest in production and testing facilities for large AR-MAX1 trains.

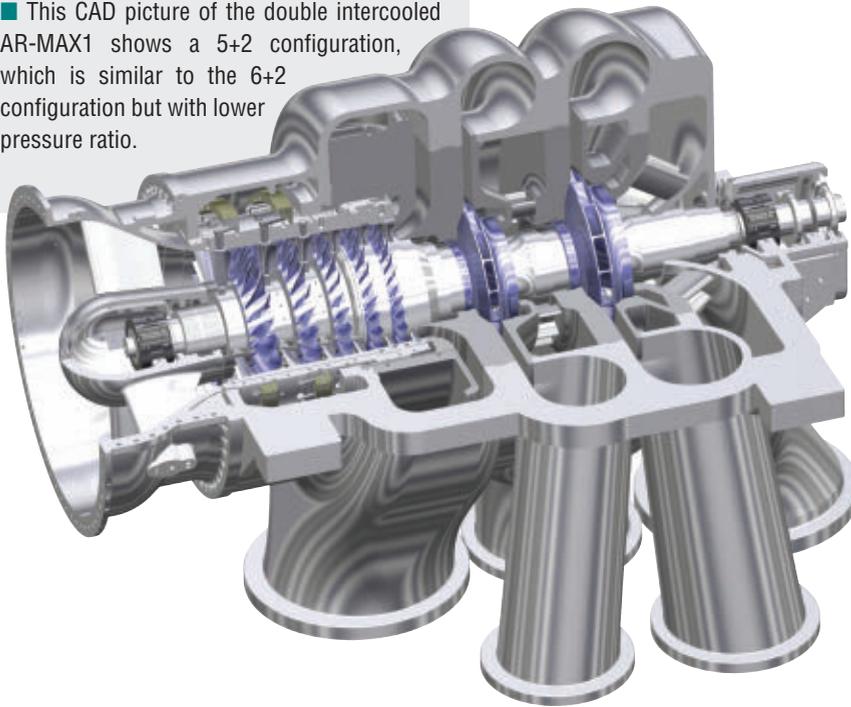
It is common practice for OEMs to conduct a full testing program before shipping equipment to the site for installation, therefore avoiding (as much as possible) unforeseen events

that may cause logistical and commissioning problems.

MDT’s Oberhausen, Germany, testing facilities can test these large trains, but with the increasing number of units to be tested and the size of these compressor trains, the company needed to streamline its in-house facilities. The electric driving power will be significantly increased and a large-size intercooler will be permanently installed in the testing hall.

For previous tests, the job intercooler (manufactured in China) was

■ This CAD picture of the double intercooled AR-MAX1 shows a 5+2 configuration, which is similar to the 6+2 configuration but with lower pressure ratio.



shipped to Oberhausen for the MAX1 test and then shipped back to China together with the whole compressor train. This cost was justified for a few times but no longer is sustainable due to the company's increased business in China.

A new shop intercooler has been installed to test the largest AR-MAX1 of the present modular system — the AR170 — which is designed for 7700 tpd (7000 T/d) oxygen plants and larger.

MDT is working on the detailed engineering for the AR140 size with capacity for about 6600 tpd (6000 T/d) of oxygen, confirming the trend towards larger ASUs. This machine weighs 253 tons (230 tonnes) and has an effective flow capacity of 35.3 MMcfh ($1 \times 10^6 \text{ m}^3/\text{hr}$).

The company said testing of both the AR 105 and 115 have shown a constant 1.9% power saving compared to the promised values, which confirms the prediction accuracy and the scalability of the AR-MAX1 modular system as well as the repeatability of the performance test setup.

In parallel with the size of the plant, the requested compression ratio is partially rising. While the present standard AR-MAX1 family features six axial

stages followed by one radial stage and one intercooler for a compression ratio of about 6.5:1, a potential next

generation will have six axial stages followed by two radial stages and two intercoolers with a compression ratio of about 9:1. The possibility of cooling the air twice during compression translates into savings in the order of 4%. Operating costs will reflect a reduction in power consumption of several megawatts due to the size of these machines.

Axial/centrifugal compressors with two radial stages and two intercoolers are not new at MDT. In the previous generation, due to the number of axial stages required, the last impeller was mounted overhung, but on the MAX1 all stages are within the bearing span.

The reduced number of high-efficiency axial stages and a staggered layout of the outlet and inlet nozzles in the radial section have allowed MDT to maintain a short bearing span so as to operate the machine below its critical speed. The other characteristic feature of the MAX1, the axial inlet provided with adjustable inlet guide vanes, is unchanged. CT2

Experience, Reliability, Integrity...

Now with three plants totaling over 400,000 SF on 53 acres

AXH air-coolers

(918) 283-9200 Fax (918) 283-9229 www.axh.com