

Innovative compressor fan design for AngloGold Ashanti

A fan prototype will be installed as part of a vapour compressor at the refrigeration plant at AngloGold Ashanti's Mponeng mine.

Refrigeration plants are generally required in deep-level mining where underground rock temperatures exceed the legal limits and the air needs to be cooled down to acceptable working environment standards. The fan in question will form a flexible blade compressor that leverages the outstanding strength of high-end composite materials.

Utilising carbon composites

According to Michael Minges, director of operations at MechCaL, the company commissioned to design the fan, the use of carbon composites allows the product to be used in extreme operating conditions of high loads.



“The use of composites in these systems allows us to re-engineer the vapour compressor and blades that can withstand the highly loaded application where each blade experiences loads of up to 70 tonnes.”

These are mainly due to centrifugal loading, as the fan of 2,4m outer diameter spins at levels of close to 3,500RPM. Some tricky design issues needed to be addressed such as the blade tip speed crossing the sound barrier at 400m/s at 120°C and reaching speeds of 440m/s.

“It is also critical to ensure that during the operational running of the fan the natural modes of the structure do not get excited, which makes the stiffness design of the fan blade material layup of vital importance” says Minges.

Good base of knowledge

Heinrich Jacobs, principal engineer at MechCaL, says: “This product is highly innovative by virtue of the merging of various metallic and non-metallic materials to form a coherent item that is finely tuned to perform exceptionally in a narrow operational band.

This project establishes a good base knowledge of highly centrifugal loaded composite structures for use in future development work and new products.

The prototype has been in development since 2012 and installation is set for August 2016.

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