



Application 2: **Australian Broadcasting Corporation Studios** **(Melbourne, Australia)**

Application

Located in Melbourne's vibrant arts district, Australian Broadcasting Corporation (ABC) Studios offer state-of-the-art studios television facilities and services. The studios accommodate lighting, electronics, equipment rooms, production personnel, and a 350-seat auditorium that needs to stay cool. This vast array of load conditions can cause significant load swings, requiring the chillers to react quickly.

Cooling technology

To handle the space-cooling requirements, ABC Studios replaced the existing chillers in 2008 with two 240-ton (840 kW_r) air-cooled chillers (Smardt A0840-3C) each using three Danfoss Turbocor® TT300 oil-free compressors. After a subsequent building expansion in 2014, three additional 230-ton (800 kW_r) evaporative chillers (Smardt EB0-2E) were installed.

Performance testing

One of the three compressors from the existing chiller was selected for performance testing. The tested compressor incurred 10 years of operation with varying space-cooling needs for the studio situated in Melbourne's temperate oceanic climate.

In September 2018, the compressor was removed from the chiller and replaced with a new TT300 compressor. The existing compressor was sent to Danfoss' test laboratory at Innovation Park in Tallahassee, Florida.

The TT300 compressor tested at 47.5 kW at the operating conditions shown in Table 3. These results also fall within the AHRI 540-2015 uncertainty limits as previously discussed.

These results were then compared with the original parameters when the compressors were shipped in 2008 from the Danfoss factory to the chiller manufacturer.

Table 3: Compressor 1 performance values for ABC Studio

<i>TT300 Compressor (90 tons nominal)</i>	Suction Pressure	Discharge Pressure	RPM	Power (kW)	Mass Flow Rate (kg/min)
2008 test	357.74	917.67	32016	46.3	96.45
2018 test	358.38	917.75	32026	47.5	95.56
Deviation	0.18%	0.01%	0.03%	2.59%	-0.92%

Test results and conclusions

- Tested deviation over a decade: From its original 2008 power test value of 46.3 kW, the compressor deviated 2.59 percent higher 10 years later (Table 3). Mass flow was 0.92 percent lower.
- Performance consistency: The range of deviation for kW and mass were all within the acceptable uncertainty limits for performance per AHRI 540-2015. This range approximates the expected performance values for new compressors. The results show the Danfoss Turbocor® TT300 oil-free compressors experienced no significant performance degradation over the 10-year period. The data are additional evidence indicating consistent, long-lasting compressor performance that is likely to extend over the life of the chiller.
- Customer satisfaction: ABC Facility Manager Greg O'Brien stated: "The deciding factors for selecting the chillers were small footprint due to limited space, no cooling towers, low noise due to the expanding residential towers in the adjacent area and the most efficient technology available." Greg further stated: "The requirements were met along with the flexibility of multiple compressor chillers to handle the fluctuating loads and the low starting current (2 amps per compressor), which allowed the existing standby generator to start the chillers."

Conclusion

Oil-free magnetic bearing Danfoss Turbocor® compressors maintained consistent energy efficiency and capacity for over a decade. That translates into zero performance degradation and substantial energy cost savings over the life of the compressor. Reductions in CO₂ emissions are also significant because the performance degradation commonly experienced with oil-lubricated compressors over the same period is avoided. There are additional benefits: Danfoss Turbocor® compressors ran reliably and simplified maintenance, indicating many more years of like-new compressor performance that will extend over the chillers' lifespans.