LIFE EXTENSION OF AIR RECEIVERS FOR WIND TUNNEL FACILITY

The experience gained by FCL staff in all aspects of pressure vessel engineering enables us to offer wide ranging support when assessing the adequacy of ageing and/or damaged plant for continued operation. In a recent case, FCL were approached by a client who wished to prolong the operational life of a set of six large air receivers which provide a reservoir of compressed air for a hypersonic wind tunnel facility. The vessels, each measuring approximately 26m in length (tan-tan) by 1.8m in diameter, were of varying age with the oldest items dating back to the 1950's. Contemporary design codes offered little or no guidance on fatigue design, raising valid concerns about the safety of the vessels for continued operation in cyclic service. These concerns were exacerbated by the discovery of cracking in fillet welds attaching the support saddles and internal bracketry to the vessel shells, together with areas of external corrosion.

FCL formulated a staged approach to assessing the integrity of the units, with an initial phase of work aimed at providing confidence that the vessels remained safe for a limited period of further operation at somewhat reduced capacity, sufficient to enable continued use of the plant while more detailed fatigue assessment could be performed with the aim of justifying a longer period of future operation.

During the initial phase, FCL's experience in working with legacy design codes and historic materials proved invaluable in establishing a suitable assessment approach and permitted us to confidently identify the margins available using a combination of design-by-rule and design-by-analysis methods. In parallel, our knowledge of fatigue mechanisms and non-destructive examination methods enabled us to recommend additional targeted inspection of the vessels, including the use of phased array ultrasonic testing. This permitted examination of the vessel shell beneath the support saddles and internal attachments in the areas expected to be of greatest risk and confirmed that none of the observed cracking extended into the pressure envelope. The calculations performed and the supplementary inspection thereby provided confidence that the observed damage did not represent an immediate risk to the integrity of the vessels and cleared the way for an interim period of continued operation. Supplementary assessment to underwrite the vessels for a defined future life and to restore full capacity remains ongoing at the time of writing and FCL look forward to providing all further support necessary to satisfy the requirements of our client.

Finglow

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