

Acoustic Emission Methodology for Inspection of Composite Overwrapped Pressure Vessels

Valery F. Godinez-Azcuaga¹, Obdulia Ley², Miguel Gonzalez¹, Sam Ternowchek³

¹Products and Systems Division, Mistras Group Inc., USA, ¹Products & Systems Division, Mistras Group Inc., Uzbekistan, ¹Corporate Division, Mistras Group Inc., USA

Composite overwrapped pressure vessels, or COPVs, consist of a thin, non-structural liner wrapped with a structural fiber composite, typically carbon, designed to hold a fluid under pressure. The liner provides a barrier between the fluid and the composite, preventing leaks (which can occur through matrix and chemical degradation of the structure). COPVs have two main advantages over similar sized metallic pressure vessels: the COPVs construction offers reduced weight and increased storage pressure. The COPVs market size is expected to post a compound average growth rate of over 22% during the period 2019-2023, mainly due to the global demand for natural gas vehicles, since natural gases are stored in COPVs. Thus, the rising demand for NGVs will drive the demand for COPVs. One of the requirements for COPVs installed in vehicles designed to transport gases, is the need to be recertified after a certain period of time. Typically, these vehicles carry up to 50 or more COPVs, therefore an NDT technique that can be applied in situ, without dismounting the COPVs from the vehicle is required. Acoustic Emission (AE) is an ideal technique for this purpose, and in fact several inspection codes incorporate AE for COPVs recertification. In this paper we discuss the development of a complete technology package that streamlines the COPV AE inspection. This technology package includes a newly design broadband sensor, state of the art multichannel data acquisition system, specially designed software for automated collection and analysis of AE signals, and pass/fail decision, which reduces the turnaround time for reporting. The complete AE technology package is currently being validated during a series of tests on type IV COPVs, some pristine and some with controlled damaged.