

DESIGN OF PRESSURE VESSELS AND PILOT LINE

An important aspect of GASVESSEL is the design and development of the prototype line for the production of steel cylinders reinforced with composite material. In this light, CNGV developed the executive drawings and the parts lists of all the mechanical components for the construction of the winding machine and the curing oven. Moreover, CNGV designed the pressure multipliers for the fatigue test and the burst test. CNGV has also selected the electrical part of the winding machine giving the necessary indications for the sizing of the axis powers and the choice of the type of computer numerical control to be installed on the winding machine.

Additionally, CNGV followed all the assembly phases of the winding machine and the fatigue and blast systems. CNGV actively collaborated with Esteco in the design of the composite material cylinder, and in the definition and identification of all the parameters and mechanical characteristics of the liner and of the individual components of the composite in order to perform the finite element analyses and check the structural calculations. Finite element analysis is a calculation method for determine the stress on structures subjected to it.

Furthermore, CNGV carried out a campaign of experimental tests, both on the steel base of the liner and on the composites in particular on the carbon fibres. More than 300 tests have been performed between steel and composite. Special equipment has been developed to quickly produce and standardise the quality of composite specimens. A particular equipment for testing rings of 2300 mm of diameter has been designed and developed.

CNGV has also followed all the experimental tests of structural verification by applying strain gauges both on the specimens and on the cylinders in order to verify the real deformations during the tests. This made it possible to develop a direct calculation of the cylinders.



Figure 1. The cylinder is based on the Patent: WO2015 / 114549 A1 - Improved method to produce high-resistance composite vessels with inner metal liner and vessels made by said method. International Application No. PCT/IB2015/050668.



WINDING MACHINE DIMENSION

Length	28m
Length	18m
Height	6m

CYLINDER MAIN CHARACTERISTICS

Cylinder Length	8.6m
Diameter	2.3m
Volume capacity	28m ³
Service pressure	300bar
Natural gas capacity	9240 Nm ³