

Use of Impedance Moisture Transmitters to ensure safety of CNG (Compressed Natural Gas) Filling Stations

Application Background

Currently there are some 2.8 million vehicles around the World that are equipped to run on natural gas, mostly in South America, Eastern Europe and Asia. However the USA in particular has taken to this new technology and has almost a quarter of the World's 6500 CNG filling stations serving its population of more than 100,000 NGVs, with more and more stations and vehicles being made CNG compatible every day.

ISO 15403:2000(E) states that "the single most important safety requirement of compressed natural gas (CNG) fuel is a very low water dew-point temperature to preclude the formation of liquid water at any time."



The SAE J1616 recommends drying CNG to $\Delta 10^{\circ}\text{F}/5.6^{\circ}\text{C}$ (at pressure) below the location's low dry bulb temperature. Dew point is an important consideration because natural gas is generally stored and dispensed under pressure.

CNG filling stations use network natural gas supplies that are typically at 1 to 1.5 barg and have a dew point of somewhere between -30 and -20°C . NGVs operate on a full tank of CNG at around 200 to 250 barg. Therefore the natural gas must be compressed by a factor of between 133 and 250 times prior to filling. This compression leads to an increase in the pressure dew point that in most cases will leave the natural gas saturated with water and often with liquid condensate. So first of all the condensate must be removed by a suitable drain and then, in order to comply with ISO 15403:2000(E), the natural gas must be dried to give a pressure dew point significantly lower than the lowest ambient temperature that will be experienced either at the filling station or in the vehicle in subsequent use.

NGV and CNG

A major motivating force in the development of the market for Natural Gas Vehicles (NGV) and therefore the introduction of more and more Compressed Natural Gas (CNG) filling stations, is the Kyoto protocol. Natural gas is cleaner burning and more efficient than traditional unleaded fuel and diesel. It has lower emission levels of key pollutants such as carbon monoxide, hydrocarbons, NO_x and particulates than these liquid fuels.

Therefore promotion of the use of NGVs will not only help to reduce pollution levels, its primary aim, but will also assist national governments in demonstrating their commitment to Kyoto. With the development of advanced CNG filling stations that can utilise the huge integrated natural gas supply network, it is also now possible to provide a

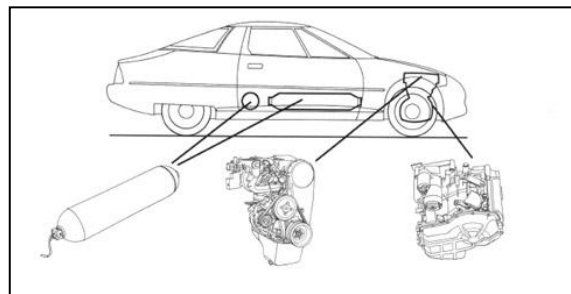


continuous supply of CNG at road-side filling stations without the need for tanker deliveries, as is the case with unleaded petrol, diesel, LNG and LPG.

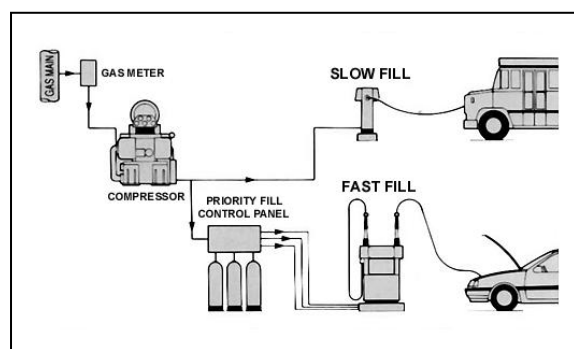
As the demand increases, price of CNG at the pump is reducing to make it competitive for the domestic user as much as for larger commercial customers. It follows that with 6500 CNG filling stations world-wide, and many more to be built and commissioned over the coming years, a key safety feature will be the incorporation of proper compressor/dryer packages to ensure compliance of the CNG.

Measurement Technique

Michell Instruments is already supplying numerous on-line and portable intrinsically safe hygrometers for the measurement and control of CNG dryer performance and is set to become the defacto standard supplier for this burgeoning market. The MDM300 I.S. is ideally suited for portable spot-checks of dryer performance by site/service engineers, whilst the Easidew TX I.S. and Easidew PRO I.S. provide a low cost solution for the on-line monitoring and changeover control of natural gas dryers, at pressures up to and beyond 250 barg.



A compressed natural gas (CNG) vehicle uses an internal combustion engine for propulsion. The engine is powered by CNG



Typical CNG filling station layout



Easidew PRO I.S.



Easidew I.S.



MDM300 I.S.



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