The new safety culture for hydrogen

Every two months, Prof. Dr. Thorsten Arnhold, IECEx Chairman 2014-2019, provides an update on developments within the organisation.

When I wrote this article, the UN Climate Conference (COP26) in Glasgow was in its decisive stage. A day before came the exciting news that two of the countries emitting the largest amount of CO2, China and the US, agreed to cooperate in their efforts towards climate neutrality. One of the central statements of the participating parties was their commitment to extend the share of clean energies significantly during the coming decade.

Because of the well-known volatility of some of these clean energies, efficient energy storage and carrier technologies will be the key to ensuring a stable and reliable energy supply in the post-fossil fuel period. Therefore, hydrogen will play a very important role for that.

In contrast to the existing production facilities for hydrogen, we have to be aware of a new safety-related situation. Unlike chemical and petrochemical plants where there is restricted public access and operations are controlled by specialists and skilled people, the new "hydrogen economy" will be widely distributed with a lot of potential public contact points and respective hazards. Therefore, there is a need for new safety concepts and special education programs for people who encounter hydrogen applications. Conformity Assessment can help to establish such elements of a new safety culture quickly and efficiently.

In some of my previous Hazardex columns, I already reported on the efforts of the international standard organisations and of the conformity assessment systems in this very important matter. Today I will explain the latest achievements. The first meeting of the new IECEx working group 19: Hydrogen took place remotely at the end of October. The following potential business cases have been discussed:

IECEx Equipment scheme

For products used in hydrogen applications there are many IIC certificates available. For potential new customers, appropriate marketing messages for the explanation of IIC should be developed.

A big gap of knowledge exists with regard to the non-electrical Ex-protection and the special dangers of hydrogen. Explosion group IIC is just covering the explosion protection techniques flameproof "d" and intrinsic safety "i". The method in ISO 80079 – 36 is the "safety by construction". Here we need solutions to avoid ignition sources with very low energies if the equipment is in contact with hydrogen/air mixtures. Mechanical Arcs, electrostatic discharges, and catalytic surface reactions (chemical ignition sources) shall be considered carefully. Under the cover of IEC 60079-46: assemblies and the risk assessment procedure in IEC 80079-36 a special program for assemblies like compressors intended for use in hydrogen applications could be established.

The well-established IECEx Certified Equipment Scheme could be used as a basis for a certification program for complete electrolysers with reference to the ISO 22734 and fuel cell systems with reference to IEC 62282-3 and -5.

Service facility scheme

Service providers working for and in hydrogen hazardous areas shall be competent concerning the special properties of the gas like the very low ignition energy, the almost invisible combustion flame, the low density etc. The IECEx Certified Services Scheme could be used to address tailor made certification programs for

- Installation companies
- Engineering and planning companies, including Zone classification
- Inspection & Maintenance providers

Special reference could be given to the ISO standards 19880 or the ISO TS15916.

Personal Competency scheme

New Units of competency for the design, production and test of machines and assemblies for use in and for the operators working in hydrogen facilities could be developed as well as for experts working for service providers. A special hydrogen-training program for Recognized Training Providers (RTP) Program would be very helpful.

This collection of ideas is not complete. In a first step to start such a special hydrogen campaign for IECEx, all certification bodies have been asked to fill out a special questionnaire published by the IECEx office. At the beginning of 2022 the results of that activity will be discussed at the IECEx executive.

Very important for further work is a close relationship with the standardisation bodies. In November, two meetings of the representatives of IEC TC 31, ISO TC 197 and IECEx took place. In an open and friendly atmosphere, the participants agreed to start a close relationship to develop appropriate programs and concepts for the hydrogen economy. ■