D5.3 – Manufacturing and commissioning of last HRSs at vehicle-user site

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INTRODUCTION

This document describes the work achieved in 2016 by Air Liquide Advanced Business in order to build and setup a hydrogen recharging station for warehouse, in Vendin, in the north of France.

The project execution presented here is simplified and is shown as list of sequential phases. For each phase, a quick summary of the work is given and the main deliverables made during the phase are listed down. Many of these deliverables are confidential and will not be given in this document.

The project has started, for the ALAB project department, in September 2016, before contract signature, and has ended the 26th June 2017.

The 10th July 2017, the customer started its operation.

1 Tasks done

1.1 First site visit

On 20th October 2016, the project team visits the customer site, to meet the customer and its engineering team, and to check all the details for the execution.

HRS charging station layout has been drawn and a first planning was shared. Few months after, the final layout of the station was shared. It includes the implantation of 3 dispensers connected to the HRS implemented outside the warehouse.

2 dispensers will be installed in the existing building and will be available for the 57 first hydrogen forklifts. The third dispenser will be located in the warehouse being built for the additional 95 hydrogen forklifts. The start of the operation was planned for summer 2017 for the first 2 dispensers and December 2017 for the third one.

Deliverables are:

- HRS platform layout,
- Dispenser zone layout,
- Concrete pad drawing.

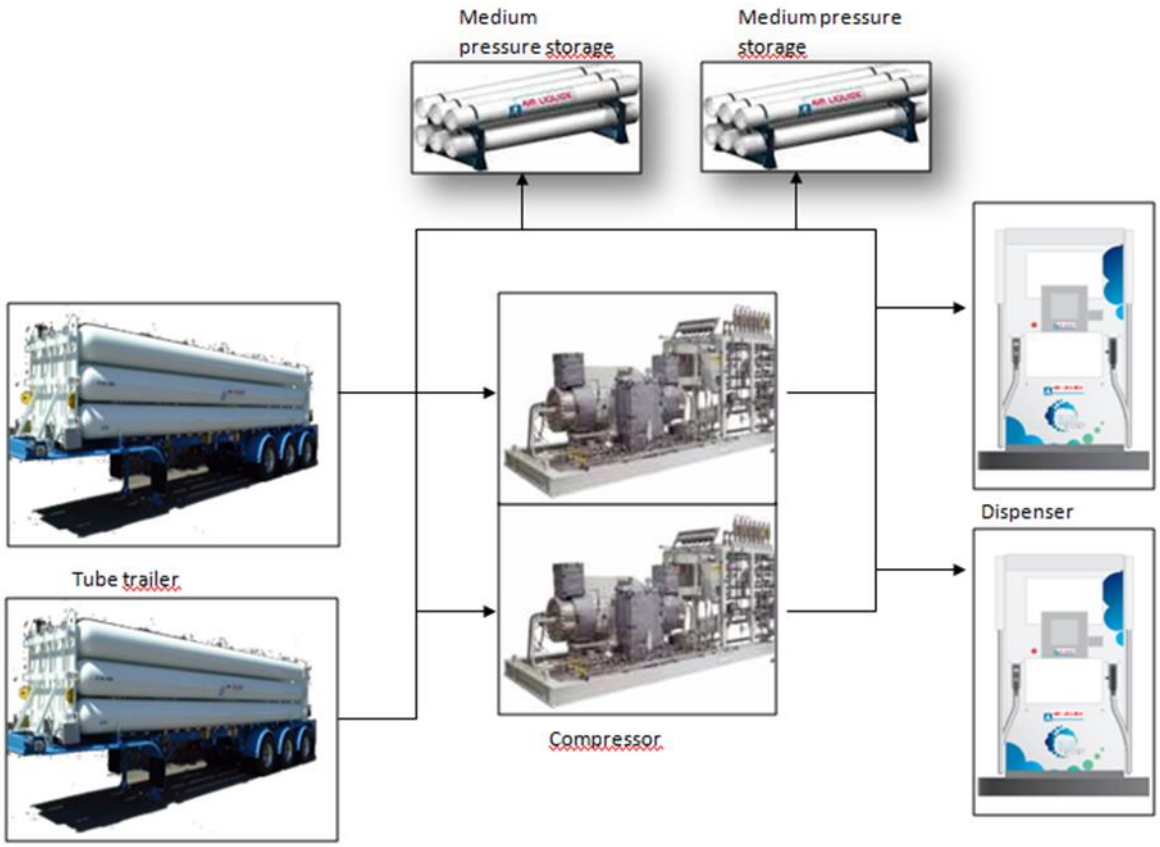

Figure 1: Global site layout

1.2 Technical specifications

This phase is dedicated to the writing of technical specification.

Main specifications are done for:

- Civil work,
- Pipe work,
- Electrical work,
- Security equipment and warning signs and panels installation,
- Ground marking specification,
- Factory acceptance tests and Site acceptance tests.

1.3 Purchase

After writing specifications, then comes the time to find subcontractors and ask them for quotations.

Deliverables are:

- HRS specifications,
- HRS upgrade quotation,
- Electrical work quotation,
- Pipe supply quotation,
- Piping work quotation,
- Equipment installation quotation,
- H_2 vent installation on the roof specifications quotation,
- Fire extinguishers specifications and quotation,
- Ground painting specifications,
- Pipe mechanical protection quotation,
- Lightning risk analysis quotation,
- Subcontractors selection,
- Orders to suppliers or subcontractors.

1.4 Risk analysis

Several risk analysis are done during such a project:

- At the first beginning of the project, a project risk analysis,
- After the selection of a solution, a preliminary risk analysis,
- During the project, a risk analysis including the equipment integrated in their locations.

1.5 Factory acceptance test (FAT)

The equipment built in Air Liquide Sassenage has been setup and tested in our facilities.

The FAT commissioning procedure is then used to check all the features, and the good operations of the HRS as well as the performance.

Deliverables are:

- FAT document filled and signed,
- All features checked,
- Actions list to solve remaining problems.

1.6 Work permits and Prevention plan

As a lot of subcontractors are working on site, a prevention plan had to be written by Air Liquide. A safety visit before working was also mandatory. Prevention plan has to be signed by all subcontractors.

Deliverable is:

- Prevention plan signed by all subcontractors and Air Liquide.

1.7 Work follow up

Between February and March 2017, civil work, pipe work and electrical work and several works took place. Several visits are mandatory to follow up the work, check the job done, and give instructions for the next period.

Four travels from Grenoble to Orleans were done by the project manager to follow the work of subcontractors.

Deliverables are:

- Meeting reports,
- Action plans.

1.8 Authority information

The site is under ICPE French regulation so the site owner needs to obtain the French local authorities permit as well as the green light from the CHSCT (committee in charge of hygiene, safety and working conditions). AL supported them to obtain the permit by receiving authorization from the CODERST (Council of Environment, Sanitary and Technological Risks), by supplying to the “DREAL Centre” administration a folder containing the description of the hydrogen installation and by organizing a visit at Prelocentre site.

Deliverable is: information folder send to DREAL.

1.9 Authority Pressure equipment registration

In France, all the equipment with pressure shall be declared to administration.

Deliverable are:

- Pressure equipment list,
- DREAL folder send.

1.10 First electrical control

An initial electrical verification is mandatory in France. This has to be done by an independent organism.

Deliverable is:

- Electrical control report.

1.11 DRPCE customer redaction

Air Liquide supplied documents to help the customer to write its own DRPCE (Document relative à la Protection Contre les Explosions) which is mandatory in France, as per European directives 1999/92/CE.

Deliverables are:

- Atex zones proposal (mapping and drawings),
- List of Atex equipment.

1.12 Security visit

Before starting up the installation with gas, a visit is organized by Air Liquide to check the whole installation from a safety point of view. The people who are doing the visit are coming from several departments of Air Liquide: commercial, technical, operation and risk management. Customers are also invited to look at the installation and do additional comments on equipment and installation.

This visit took place on the 17th of May, 2017.

Deliverable is:

- Meeting report with action plan.

1.13 Commissioning

Before starting the station, all the work done concerning the process has to be checked before the first gas introduction.

A ready for start-up review is done first to put nitrogen inside the equipment and to proceed with functional tests under nitrogen.

Then, another ready for start-up review is done to continue with hydrogen. After that, we can proceed with the complete start-up of the equipment.

All features of the equipment is checked, all parameters are set to adapt to the specific needs of the site and of the vehicles.

The commissioning started in June 2017.

Deliverables are:

- AL commissioning report signed,
- AL ready for start-up review signed,
- Commissioning documents signed with subcontractors.

1.14 Site acceptance tests

After commissioning, the equipment is ready to operate as in production. The FAT specification is used to check again the features and the performance of the charging station.

Deliverables are:

- Equipment ready to operate,
- SAT document signed (in French).

The Hydrogen Charging Station has been working since 10th July 2017.

1.15 Customer managers training

A specific training has been delivered to the customer managers:

- H_2 training, including gas general presentation and risks,
- HRS training with specific description and risks,
- Forklifts filling operations.

Deliverables are:

- H_2 general training and risks training,
- HRS training session,
- Managers training, with timesheet signed.

1.16 Customer operator's Training

Several sessions of training has been dispensed to customer's operators, including a theoretical presentation of the hydrogen, the station principles and forklifts filling.

Theses training sessions occur the week after the manager training.

Deliverables are:

- Operators simplified training,
- Operators training sessions,
- Operators knowledge controls,
- With timesheet signed.

2 Appendix: Pictures of the work on site

2.1 Civil work

Figure 2: Levelling activities

Figure 3: Trenching activities

2.2 Delivering and installing equipment on site

Figure 4: Dispenser delivery

Figure 5: Buffers delivery and installation