EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH
ORGANISATION EUROPÉENNE POUR LA RECHERCHE NUCLÉAIRE

CERN - TS Department

EDMS Nr: 473741
Group reference: TS-LEA

TS-Note-2004-030
5 May 2004

MANAGING THE DETECTOR FIXED GAS DISTRIBUTION CONTRACTS

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Abstract

This presentation will explain what is involved in managing the two contracts that are in place for the detector fixed gas distribution networks. The work under Contract F-447 involves the supply and installation of two completely new fixed gas distribution systems located at point 1 and point 5. These systems start in the gas buildings located on the surface and finish at the proximity of the detector in the experimental cavern. The work under contract E-070 involves the modifications to the pre-existing LEP fixed gas systems located at points 2 and 8 which will be re-used for the ALICE and LHCb experiments. This contract also operates and maintains the SPS, PS and experimental hall gas systems that are located all over CERN.

Presented at the TS Workshop
Archamps, France, May 4 – May 6, 2004

1 WHY DO WE NEED A FIXED GAS SYSTEM?

Several particle detectors require specific inert gases and/or a mixture of inert and flammable gases in order to operated correctly. In order to provide these gases, all of the experimental areas are equipped with a fixed gas distribution network. These systems represent around 60 km of thin-wall stainless steel and copper pipes which supply high-purity gas from the storage areas up to the proximity of the detectors positioned in the experimental halls and installed at intersections of the particle beam in the underground areas (This is the case for the ALICE, ATLAS, CMS and LHCb experiments of the LHC).

The operation and maintenance of the 12 gas storage buildings and the gas distribution networks in carried out by the DES (Detector Services) section of the Group TS-LEA.

2 WHO IS OUR CUSTOMER?

The DES section provides basic services to keep the experiments with a continuous supply of high purity gases. Its responsibility is restricted to the forwarding of gas from the stocks and pressure reduction areas to the first distribution panel next to the particle detector. The physicists responsible for the specific detector perform proximity and internal services to the detector, with the EP division support, such as the implementation and maintenance of purifiers, gas mixing units or mass flow meters. The CSE group of TS Department remains in charge of the flammable gas detection systems in experimental areas.

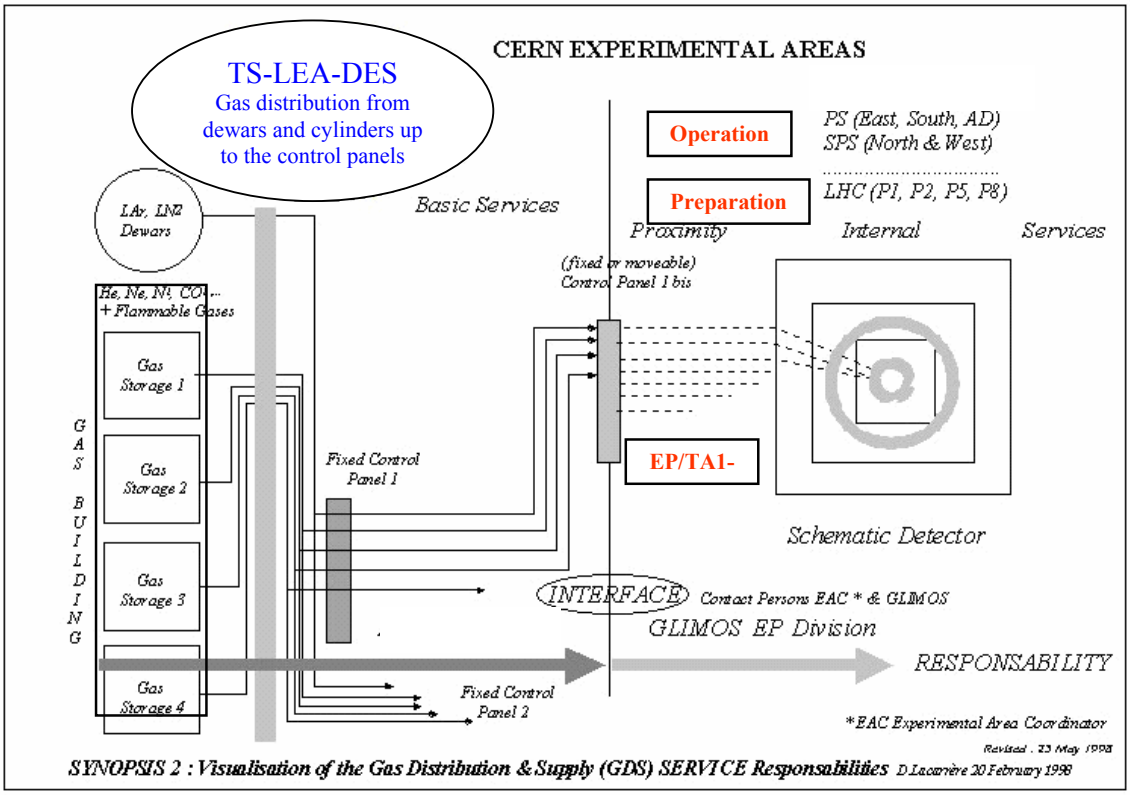

Figure 1: Responsibility scheme for a typical gas system

3 THE SERVICE D.E.S. PROVIDES

The DES service is aimed to operate the complete fixed gas installations for both flammable and inert gases in all CERN experimental areas, up to the agreed interfaces with the corresponding experiments. (See Fig 1.)

The main tasks falling to the DES service are summarized below:

- Technical maintenance of the gas distribution network and the 12 gas buildings provision and installation of control panels, exhausts, safety valves, electro-valves and pneumatic valves. (See Appendix 1 for a complete list of existing systems.)
- Management of the liquid argon contract.
- Sub-contracting of significant installation or repair jobs (piping and connections).
- Monitoring of the inert gas consumption.
- Internal gas requirements (via EDH), replacement of empty cylinders or cylinder batteries, refilling of liquid argon and liquid nitrogen dewars.
- Regular technical inspection of the entire gas distribution network.
- Taking care of all safety aspects required by the use and the handling of compressed flammable and inert gases (along with the Safety Commission, the FGSO and the experimental area Co-ordinators).

Implementation of new gas lines and new fixed distribution systems in some areas (at P1, P5), in parallel with the improvement of the existing installations (P2, P8) by adjusting them to the new standards, as far as the LHC experiments are concerned.

4 CONTRACTS IN PLACE

4.1 F-447

Contract F-447 concerns the design, supply, installation and commissioning of the distribution systems for clean gases that are required for the operation of particle detectors at points 1 and 5 of the LHC. The fixed gas systems are part of the experimental detector infrastructure. This includes cryogenic storage Dewars (These will be supplied separate to this contract), neutral and flammable gas regulation units for the storage and distribution of primary gases. These are located on the surface in designated gas buildings (SGX) above each experiment. The gases are then distributed to the experimental caverns, 80 m to 100 m underground, via a fixed network of stainless steel pipes.

The extent of the Contract covers gas regulation and changeover units, stainless steel pipes and manifolds etc, in surface buildings, galleries, tunnels and underground areas.

This contract started in 2002 and is expected to be completed by the end of 2005.

4.2 E-070

Contract E-070 concerns the technical support required for the Maintenance and Operation (M & O) of the Gas Distribution Systems (G.D.S.) for particle detectors in all the existing and future experimental areas of CERN. (Approximately 60 km of stainless steel piping with outer diameters ranging from 6 mm to 127 mm and 15 km of copper piping with outer diameters ranging from 6 mm to 22 mm) The contract has been placed for a three-year period starting mid 2002. The technical support is essentially in the domain of piping work and gas handling equipment for clean gases. The work mainly consists of the operation of the Gas Distribution Systems and the pre-fabrication, installation and commissioning of new gas pipelines and/or modifications to the existing gas networks. The work at CERN is organised in response to the requests of gas system users in the experimental areas on both the Swiss and French parts of the CERN site.

This contract is also being used for the modifications that need to be made to the existing gas distribution systems at Points 2 and 8 so that they are suitable for the requirements of ALICE and LHCb respectively.

5 KEY POINTS TO MANAGE

In order for both of these contracts to run smoothly and efficiently, there are several key aspects to the contracts that have to be carefully managed. These are:

- Planning and scheduling
- Payments schedules
- Fire permits
- A.O.C.'s (Avis d'Ouverture de Chantier)
- Organising pre-work safety inspections
- P.P.S.P.S. (Plan Particulier de Securité et de Protection de la Santé)
- Permits to ensure that people can work in France and Switzerland

6 CONCLUSIONS AND OUTLOOK

The installation work for the fixed gas distribution systems at all 4 points of the LHC are on schedule. The response and quality of the work from the contract companies carrying out the work is to a very high standard according to the specifications requested.

As an improvement to reduce operation time for monitoring all of the gas systems, a computerized local and remote control system for monitoring the gas distribution and supply in all of the experimental areas of CERN, is being introduced to the existing gas buildings.

Regular communication between the Gas Coordination Panel and the experiments themselves is vital in order to ensure that DES continues to provide the best service it can and look for ways to improve this service to its customers.

APPENDIX 1: OVERVIEW OF GAS DISTRIBUTION NETWORKS

Table 1 shows the total number of existing systems that make up the Gas Distribution System. The purpose of this Contract is to operate, maintain and modify these systems as well as install new systems if required.

Experimental Areas	Gas Buildings	Number of km of Pipes	Number of Neutral Gas panels	Number of Flammable Gas panels	Number of Dewars	Number of Patch Panels
LHC Point 1**	SGX1	15	7	5	1 (Ar) 6 m^3 * 1 (N2) 11 m^3 * 1 (CO_2) 6 m^3 *	8
LHC Point 2***	2270	10	7	6	1 (Ar) 6 m^3 1 (N2) 5.3 m^3	7
LHC Point 5**	SGX5	15	7	3	1 (Ar) 6 m^3 * 1 (N2) 11 m^3 * 1 (CO_2) 6 m^3 *	10
LHC Point 8***	2870	10	7	6	1 (Ar) 6 m^3 1 (N2) 10 m^3	7
PS AD Hall	193	1	5	0	0	2
PS EAST Hall	157	3			0	
PS South Hall	150	2			0	
SPS North EHN1	907 909	14 6	4 0	0 20	1 (Ar) 6 m^3 0	26
SPS North EHN2	908	2	0	7	0	9
SPS North ECN3	920	2	0	8	0	4
SPS West Hall	297 182	4 1	4 3	15 1	1 (N2) 6 m^3 1(Ar) 6 m^3	6 1
ISR Zone	283	5	6	1	0	1
Workshop	284	0	0	0	1 (N2) 600 Ltrs	0
Mobile Dewars	-	-	-	-	3 (N2) 500 Ltrs 3 (Ar) 500 Ltrs 1 (N2) 320 Ltrs	-

Table 1: Gas Distribution Systems in the Experimental Areas of CERN (For operational purposes)

* Rented Dewars. Will not be in operation until 2006

** Maintenance & Operation foreseen to start at the end of 2006

*** Extensive modifications are required before operation commences in 2006