



CRYOGENICS OPERATIONS 2008

# Application of a CAMMS to CERN's cryogenic installation park

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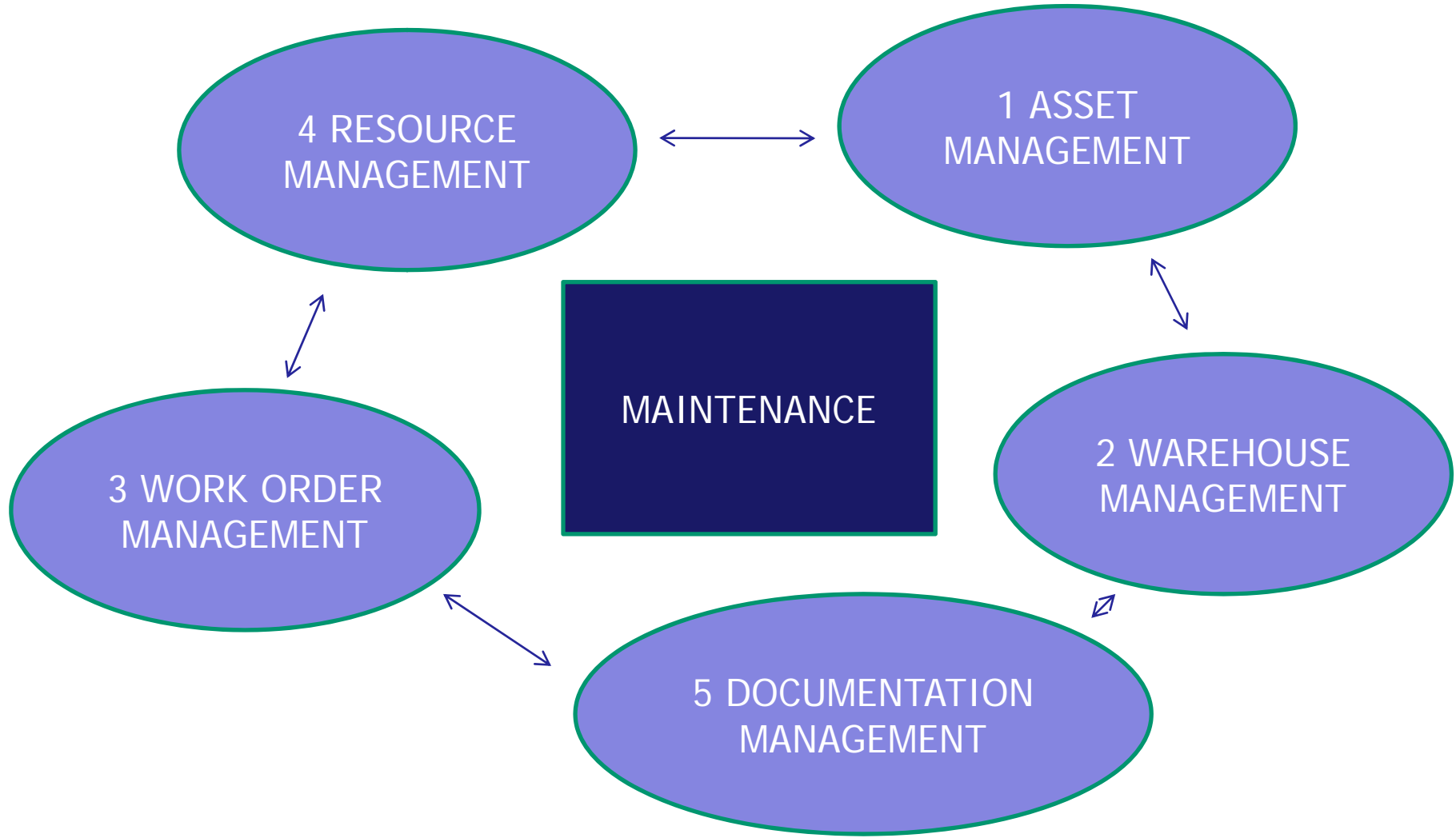
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# CERN extract of inventory

| Mechanical components |       | Instrumentation |      |
|-----------------------|-------|-----------------|------|
| Adsorbers             | 60    | Flow measurem.  | 170  |
| Filters               | 827   | Level measurem. | 163  |
| Compressors           | 104   | Speed meas.     | 173  |
| Control valves        | 1426  | Pressure meas.  | 2483 |
| Manual valves         | 11753 | Temp. meas.     | 2697 |
| Safety valves         | 1578  | Moisture meas.  | 65   |
|                       |       |                 |      |
| .. . . .              |       | .. . . .        |      |
|                       |       |                 |      |



# Management tasks





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# 1 Asset management

- **Keeping track of all physical assets throughout their whole lifecycle.**
- **THIS IS THE BASIS!**  
Especially if you wish to ensure planned and proactive maintenance  
If you don't do EAM, you're in « run-to-failure-mode »



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# 1 Asset management - Structure

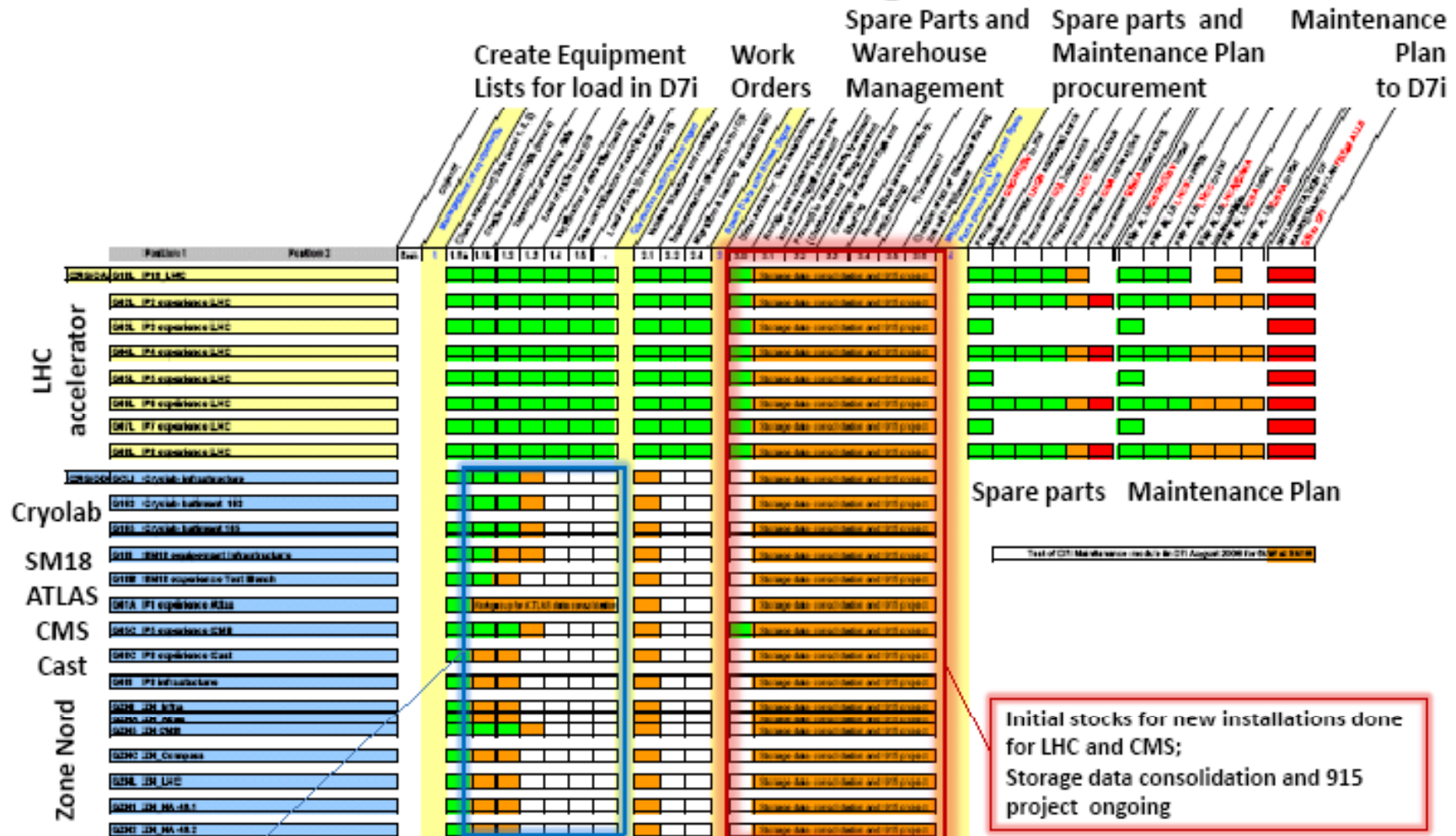
Level 1 - domain e.g. accelerator

Level 2 - system e.g. point 8 refrigerator

Level 3 - subsystem e.g. compressor station

Level 4 - component e.g. instrument

# 1 Asset management – roadmap



treatment of existing data ongoing for the different cryogenic installations

Initial stocks for new installations done for LHC and CMS; Storage data consolidation and 915 project ongoing

Courtesy of the ALLS maintenance team



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# 1 Asset management

- Keeping track of all physical assets throughout their whole lifecycle.
- **THIS IS THE BASIS!** Especially if you wish to ensure planned and proactive maintenance  
If you don't do it, you're in « run-to-failure-mode »
- **STATUS: Databases have been created for the accelerator installations.**
- **PLANS: Still to be completed for the detector installations and the older installations. Active assets need to be declared.**



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## 2 Warehouse management

- **Similar to asset management – keeping track of all spare parts and all transactions**
- **This helps to reduce the buried investment.**
- **STATUS: Pre-LHC parts OK.  
LHC parts are just being loaded.  
Criticality analysis carried out on a part of the installations.**
- **PLANS: Parts and criticality analysis for other installations to be completed.**





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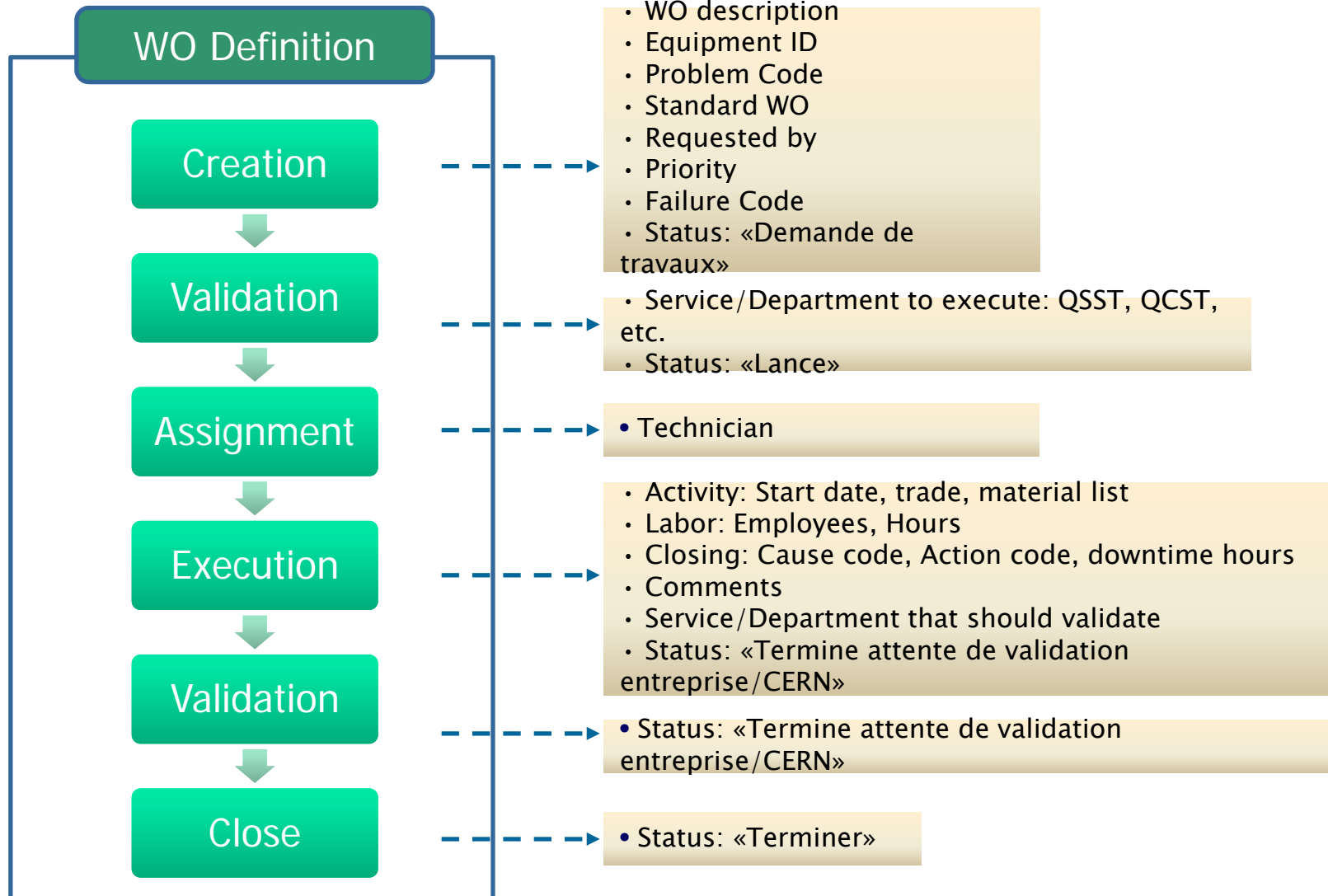
## 3 Work order management

- **Organizing the workflow of corrective and preventive maintenance, i.e. managing and keeping track of interventions**



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# 3 WO management - workflow

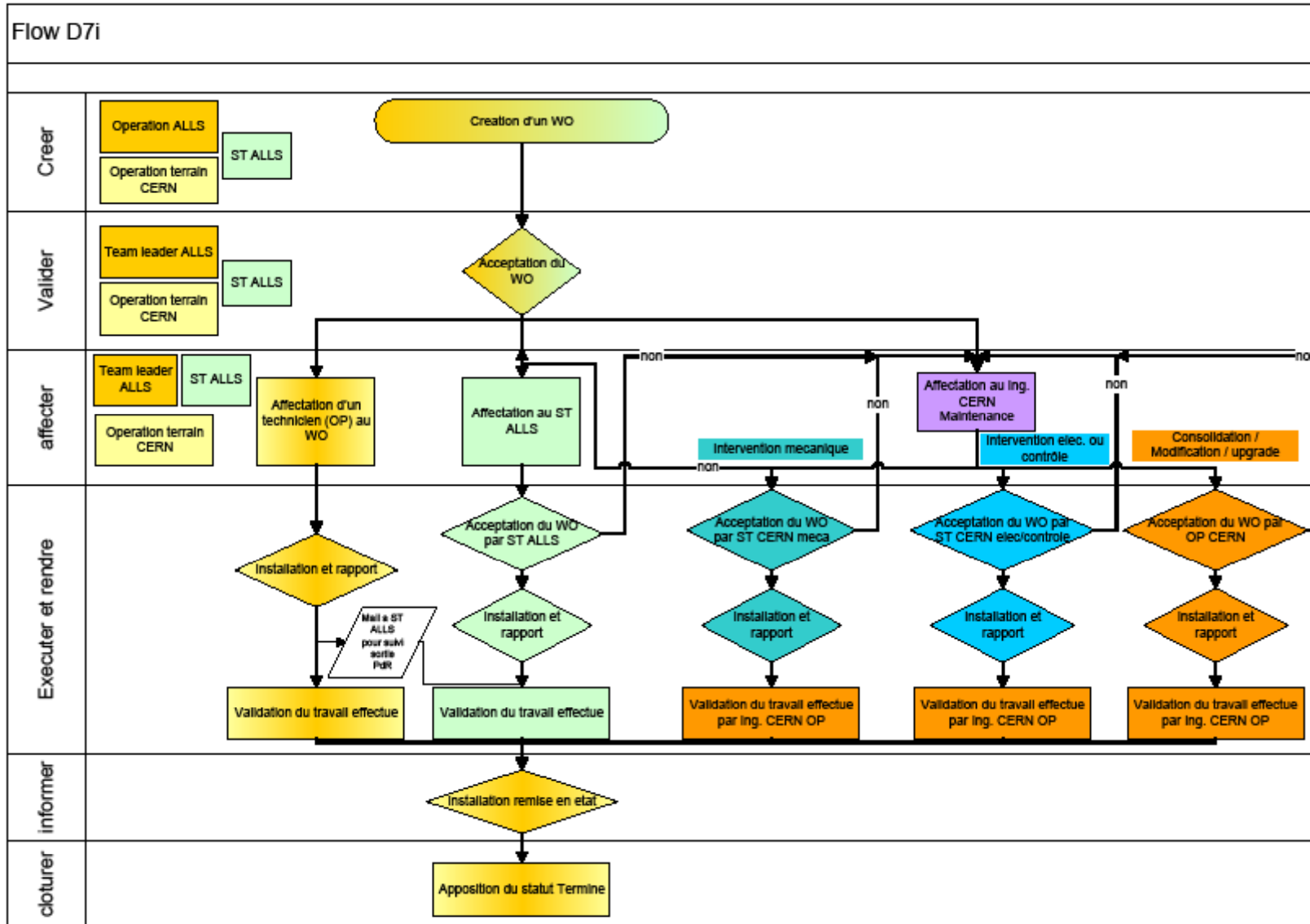




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# 3 WO management – the reality



# 3 WO Management – in D7i

WO Definition

Creation

Validation

Assignment

Execution

Validation

Close

The screenshot displays the 'Datastream 7i' web application interface. The browser title is 'Datastream 7i - Windows Internet Explorer provided by CERN'. The application has a navigation menu with 'Work', 'Materials', 'Equipment', 'Purchasing', 'Operations', and 'Administration'. The main content area shows a 'Work Order: 15154610' with the description 'Problème constaté'. The status is 'Lance' and the equipment is 'QSCA-EM01=SH2'. The form includes sections for 'Work Order Details' (Location: SH2, Class, Problem Code: \*PF, Criticality, PM Code, Standard WU, Priority: Basse, Cost Code, Target Value), 'Scheduling' (Reported By: TBATISTA, Date Reported: 07/09/2008 14:17, Assigned By, Assigned To: TBATISTA, Sched. Start Date: 07/09/2008, Sched. End Date: 07/09/2008), and 'Activity' (Trade, Task, Material List, Estimated Hours, Hours Remaining, People Required). There are also 'Custom Fields' for 'Opérateur (ID CERN)'. The interface includes various navigation icons and a 'Logout' link.



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# WO management - tasklist

Datastream 7i - Windows Internet Explorer provided by CERN

**Datastream 7i** START CENTER MY ACCOUNT HELP ABOUT LOGOUT

Work Materials Equipment Purchasing Operations Administration

**Work Order: 15319939** Vanne 5HV365 sur collecteur de purge QUICA fuyarde **Status:** Lance **Equipment:** QUICA-4-5HV365

List View Record View Comments Activities Book Labor Add Tab

Datasy: QCSM Records: 13 of 13 (1237) --No Filter--

| Work Order | Description   | Status                                 | Department | Equipment      | Class | Reported By | Sched. Start Date |
|------------|---|--|------------|----------------|-------|-------------|-------------------|
| 15319939   | Vanne 5HV365 sur collecteur de purge QUICA fuyarde                  | Lance                                  | QCSM       | QUICA-4-5HV365 |       | 90726       | 05/23/2007        |
| 15320029   | Surchauffe de la pompe a diff 1P340 QURC                            | Terminé, attente validation entreprise | QCSM       | QURCB-4-1P340  |       | 78709       | 12/07/2007        |
| 15320032   | QUICA Fuite en ligne 1,3 et 5HV365                                  | Lance                                  | QCSM       | QUICA-4-XX01   |       | 78709       | 03/04/2008        |
| 15320053   | fuite interne TUA vers enceinte boite froide                        | Terminé, premiere validation           | QCSM       | QSRB-8-XX01    |       | 89573       | 06/10/2008        |
| 15320404   | P6_Problemes de givre sur réseau de purge QUI                       | Lance                                  | QCSM       | QUICB-6-7HV361 |       | 34232       | 06/10/2008        |
| 15323491   | Fuite en ligne de 3PV750 vers l'He guard QUI                        | Accepte                                | QCSM       | QUIA-2-3PV750  |       | 75195       | 07/02/2008        |
| 15327492   | construction of 4 LHe lines for He transfer between truck and tanks | Accepte                                | QCSM       | QLDH2-18I-XX01 |       | 36148       | 07/14/2008        |
| 15327494   | construction of 1 LN line to fill LN to LHe truck.                  | Lance                                  | QCSM       | QLDH2-18I      |       | 36148       | 07/14/2008        |
| 15327495   | Install a protection between LN tank on left side of it             | Lance                                  | QCSM       | QLDH2-18I      |       | 36148       | 07/14/2008        |
| 15327496   | Installation of Gardner level indicator                             | Lance                                  | QCSM       | QLDH2-18I      |       | 36148       | 07/14/2008        |

## 3 Work order management

- Organizing the workflow of corrective and preventive maintenance, i.e. managing and keeping track of interventions
- **STATUS: Workflow is operational and applied for accelerator installations.**
- **PLANS: Integration of all other installations; Integration of the maintenance plan; definition of routes; linking of spare parts to maintenance tasks.**



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## 4 Resource management

- **Attributing resources to the work order task and managing all related aspects.**
- **CERN outsources the maintenance and this part is therefore under the full responsibility of the contractor.**



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## 5 Documentation management

- **Ensuring the availability of up-to-date documentation (PIDs, electrical drawings, manuals, ...)**
- **STATUS: A part of the documentaton has been stored on CERN's data repository EDMS.**





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# 5 Doc. management - EDMS

EDMS Web Navigator - Windows Internet Explorer provided by CERN

https://edms.cern.ch/cedar/plsql/navigation.tree?cookie=7842431&p\_top\_id=1536077160&p\_top\_type=P&p\_open\_id=1411410047&p\_open\_type=P

dpi pressure calibrator

File Edit View Favorites Tools Help

Links AIS D7i D7i-TEST eBay EDH EDMS ELOG GP Goran Hotmail Library MMM Safety valves Search SHS Specs AB-CO-IS TIMBER ViaMichelin webHRT Wiki

EDMS Web Navigator

**CRYO-Maintenance**

Reset Set as Top Search Re-login

GP<sup>ERINIC</sup>

- CRYO-Maintenance
  - Documentation
    - Equipment lists
    - Technical documentation
      - Assemblies
        - Ambient temperature cryogen storage tanks
        - Gas compression systems - QxC
          - LEP12kW9891
          - ATLAS\_SR
          - ATLAS\_MR
          - LHC18kW98**
          - ATLAS\_ANRS
          - CMS
          - LHCC\_Linde
          - LHCC\_AirLiquide
          - QSDN\_50kl\_LN2
        - Driers and purifiers - QxA
        - Refrigeration and distribution units (Cold Bo
          - LEP12kW9891
          - ATLAS\_SR

**EDMS**

**LHC18kW98**

Description: LHC18kW98

Eq. Code:

EDMS Id: CERN-0000075747 v.0

Responsible:

Home | Navigator | Search | Help | EDMS Site | Caddie | Logout

User: GP<sup>ERINIC</sup>

Displayed

[Compact listing](#)

[Extended listing](#)

[Hide obsolete](#)

[Show obsolete](#)

Sorted by

Default

Number

Creation Date

Status

Documents in this node: 16 [Create Doc.](#) [Advanced](#)

|   |                                  |  |
|---|----------------------------------|--|
| <b>947907 v.1</b>   | 1. Introduction and Safety       | <b>In Work</b>                           |
| <i>EDMS Id 947907</i>   |                                  |  |
| Introduction and safety as part of operating manual for LHC18kW |                                  |  |
| <a href="#">Doc. page</a>                                       |                                  |  |
|   |                                  | 1 sub-doc 1 version                      |
|   |                                  | <a href="#">Anna BIRD, goran PERINIC</a> |
|   |                                  | 2008-08-08                               |
| Manual / Guideline - Maintenance                                |                                  |  |
| <b>947908 v.1</b>   | 2. Plant Process and Description | <b>In Work</b>                           |
| <i>EDMS Id 947908</i>   |                                  |  |
| Plant process and description as part of manual for LHC18kW     |                                  |  |
| <a href="#">Doc. page</a>                                       |                                  |  |
|   |                                  | 12 sub-docs 1 version                    |
|   |                                  | <a href="#">Anna BIRD, Goran PERINIC</a> |
|   |                                  | 2008-08-08                               |
| Manual / Guideline - Maintenance                                |                                  |  |
| <b>947914 v.1</b>   | 3. Plant Operation               | <b>In Work</b>                           |
| <i>EDMS Id 947914</i>   |                                  |  |

Local intranet 100%



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## Summary

- **CERN has deployed an industrial CAMMS on a large part of its installations for asset, warehouse and work order management.**
- **Documentation management is based on CERN's data repository EDMS.**
- **It is foreseen to use further capabilities of the CAMMS in the near future: i.e. active assets, routes, maintenance plan and various interlinking options.**



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# The different cryogenic departments in D7i

Datastream 7i - Windows Internet Explorer provided by CERN

**Datastream 7i** START CENTER MY ACCOUNT HELP ABOUT LOGOUT

Work Materials Equipment Purchasing Operations Administration

Department: **QA2L** AIR LIQUIDE LINDE SERCO CRYO

List View Record View Add Tab

Datasp: CRYO\_dep=Q% non Records: 18 of 18 (123?) --No Filter--

| Department | Description                        | Class | Default Store | Screener | Default Supervisor | Out of Service           |
|------------|------------------------------------|-------|---------------|----------|--------------------|--------------------------|
| QCOD       | OPERATION CERN OD                  |       |               |          |                    | <input type="checkbox"/> |
| QCR        | CRYO                               |       |               |          |                    | <input type="checkbox"/> |
| QCRM       | RESPONSABLE MAINTENANCE CERN       |       |               |          |                    | <input type="checkbox"/> |
| QCSE       | SERV. ELECTRIQUE DU CERN           |       |               |          |                    | <input type="checkbox"/> |
| QCSM       | SERV. MECANIQUE CERN               |       |               |          |                    | <input type="checkbox"/> |
| QCST       | SERV. TECHNIQUE DU CERN            |       |               |          |                    | <input type="checkbox"/> |
| QEX        | ENTREPRISE EXTERIEURE              |       |               |          |                    | <input type="checkbox"/> |
| QQA        | EQUIPEMENT ACCELERATEUR            |       |               |          |                    | <input type="checkbox"/> |
| QOD        | EQUIPEMENT EXPERIENCE              |       |               |          |                    | <input type="checkbox"/> |
| QSOA       | OPERATION SOUS TRAITANT OA         |       |               |          |                    | <input type="checkbox"/> |
| QSOD       | OPERATION SOUS TRAITANT OD         |       |               |          |                    | <input type="checkbox"/> |
| QSSD       | SERV. DESSIN SOUS TRAITANT         |       |               |          |                    | <input type="checkbox"/> |
| QSSE       | SERV. INSTRUM. SOUS TRAITANT       |       |               |          |                    | <input type="checkbox"/> |
| QSSM       | SERV. MECANIQUE SOUS TRAITANT      |       |               |          |                    | <input type="checkbox"/> |
| QSST       | SERV. TECHNIQUE ENT. SOUS TRAITANT |       |               |          |                    | <input type="checkbox"/> |
| QSSV       | SERV. VIDE SOUS TRAITANT           |       |               |          |                    | <input type="checkbox"/> |

start | 1.MAINTENANCE... | EO\_AP - Microsof... | Datastream 7i - ... | Datastream 7i - ... | Microsoft PowerP... | EN ? | 10:18



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# Details of 1 work order

**Datastream 7i** - Windows Internet Explorer provided by CERN

START CENTER MY ACCOUNT HELP ABOUT LOGOUT

Work Materials Equipment Purchasing Operations Administration

**Work Order: 15320053** fuite interne TUA vers enceinte boite froide

Status: Terminé, premiere validation  
Equipment: QSRB-8-XX01

List View Record View Comments Activities Book Labor Add Tab

Work Order: 15320053 fuite interne TUA vers enceinte boite froide  
Equipment: QSRB-8-XX01 CODE GENERIQUE  
Type: Correctif Depannage Status: Terminé, premiere  
Department: QCSM Safety:   
Warranty:

Created By: GALLON  
Date Created: 06/10/2008

**Work Order Details**

Location: SD8  
Class:  
Problem Code: QPR07  
Criticality:

Standard WO: QINTMECA  
Priority: Moyenne  
Cost Code:  
Target Value: CHF

**Scheduling**

Reported By: 89573  
Date Reported: 06/10/2008 10:32  
Assigned By:  
Assigned To:  
Sched. Start Date: 06/10/2008  
Sched. End Date: 06/11/2008

**Custom Fields**

Opérateur (ID CERN):

Estimated Hours: 2  
Hours Remaining: 2  
People Required: 1

**Datastream 7i** - Windows Internet Explorer provided by CERN

START CENTER MY ACCOUNT HELP ABOUT LOGOUT

Work Materials Equipment Purchasing Operations Administration

**Work Order: 15320053** fuite interne TUA vers enceinte boite froide

Status: Terminé, premiere validation  
Equipment: QSRB-8-XX01

List View Record View Comments Activities Book Labor Add Tab

Add Comment | View Audit Trail

**Created** - Arnaud GALLON(GALLON) [06/10/2008 10:38]:  
**Modified** - Arnaud GALLON(GALLON) [06/10/2008 10:46]:  
- Description du problème : fuite interne entre TUA et enceinte a vide de la boite froide, ce qui provoque une degradation du vide interne de la BF  
-Vérifications/Modifications déjà effectuées : isolation de la TUA et pompage en permanence par le collecteur de la turbine  
-Proposition de modification / travail à effectuer : demontage tuA ou ouverture enceinte pour detection et reparation fuite, test de fuite.  
-Permis Requis : (...)  
- Travail Déjà Fait : .....

**Created** - Sigrid Knoops(SIGRID) [08/07/2008 11:56]:  
Fuite trouve et repare (tete de vanne vers l'atmosphere), pendant shutdown P8.