
Quality assurance - documentation and diagnostics during interventions

Corrective maintenance seen from the
Technical Infrastructure operation

Peter Sollander, AB/OP

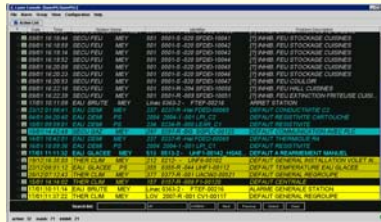
Outline

- Introduction to TI operation
- Alarm integration
- CAMMS at CERN
- Intervention workflow
- Follow-up of interventions
- Statistical analysis of interventions
- Strong and weak points of our system
- Extended use

Technical Infrastructure operation

- TI, 72201 → 24*365 operation from the CCC
- Monitoring
 - Electricity, cooling, ventilation, safety, access control, heavy handling, control systems, vacuum, cryogenics, ...
- Corrective maintenance
 - Perform first-line interventions (when possible)
 - Prepare and dispatch work orders to maintenance teams
 - Help users to follow up requests
 - Statistics and general follow up of maintenance activity
- Tools
 - Laser Alarm screens
 - Electrical Network Supervisor (ENS)
 - Technical Infrastructure Monitoring (TIM)
 - Computer Assisted Maintenance Management System DataStream 7i

Workflow for on-site interventions

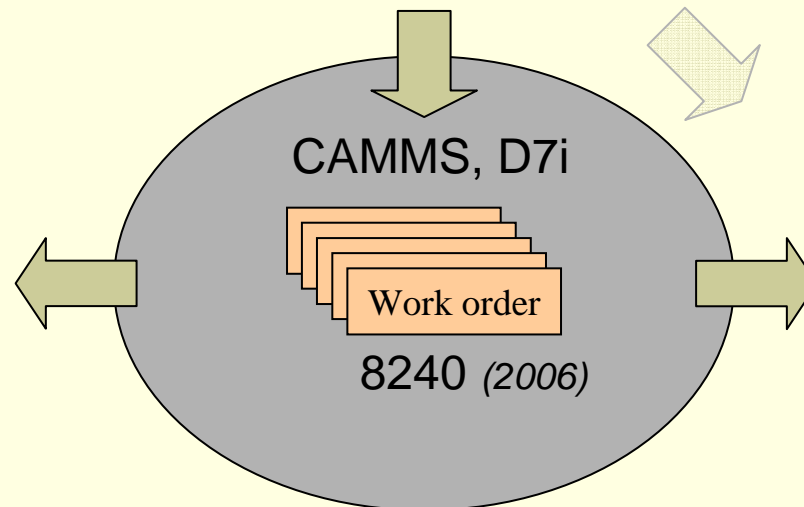


Alarms
~10⁵



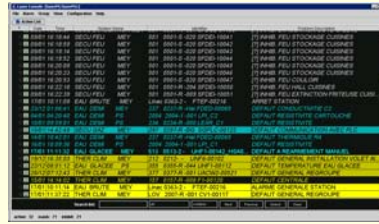
Telephone calls
~25000 (2006)

TI first-line
323 (2006)
1120 (2004)



Contractor &
CERN
interventions

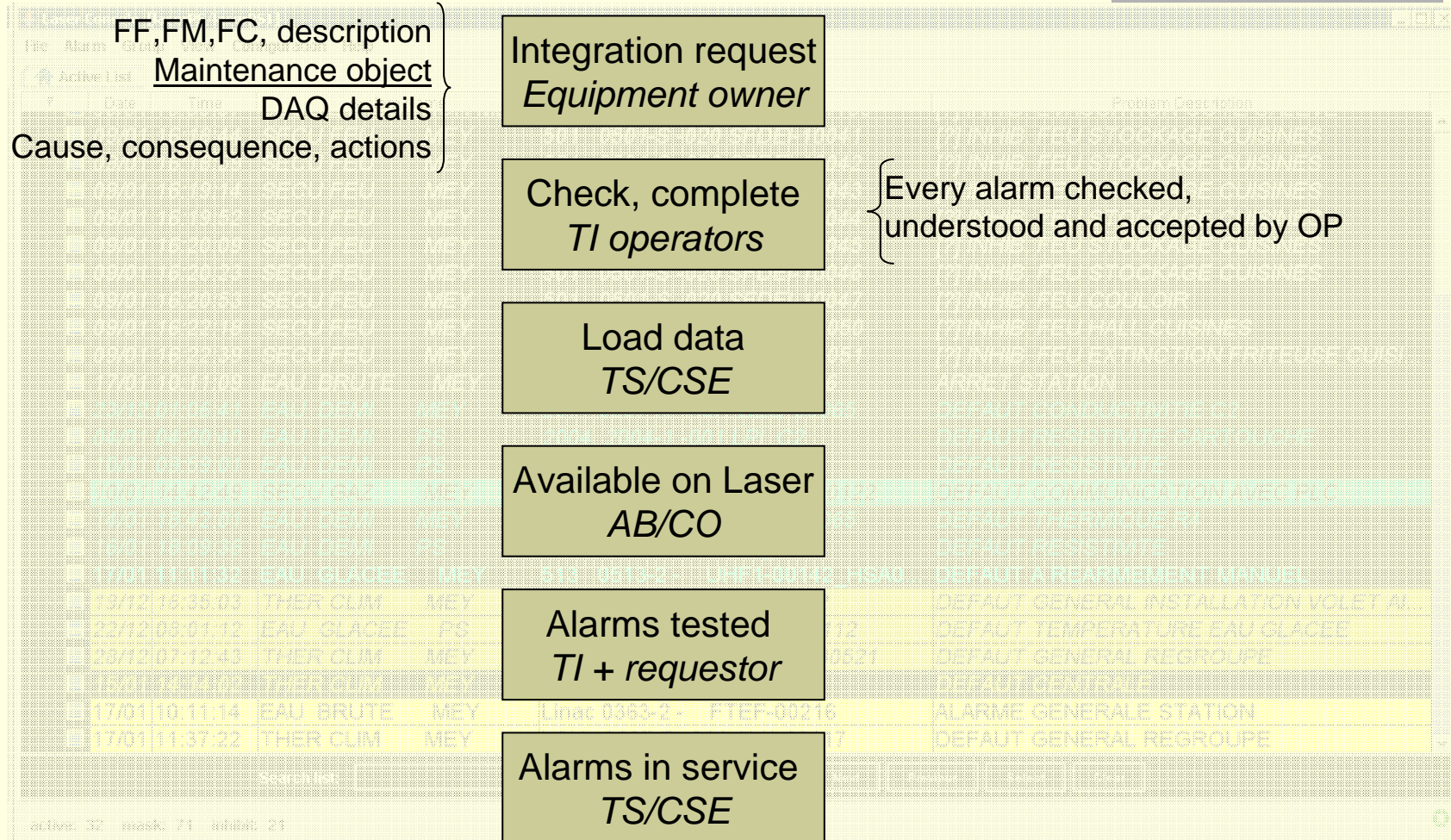
Alarms



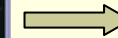
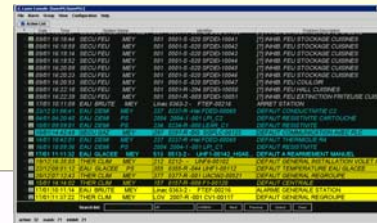
Time	Description	Status
10:10:00	ALARM: CPU	OK
10:10:05	ALARM: CPU	OK
10:10:10	ALARM: CPU	OK
10:10:15	ALARM: CPU	OK
10:10:20	ALARM: CPU	OK
10:10:25	ALARM: CPU	OK
10:10:30	ALARM: CPU	OK
10:10:35	ALARM: CPU	OK
10:10:40	ALARM: CPU	OK
10:10:45	ALARM: CPU	OK
10:10:50	ALARM: CPU	OK
10:10:55	ALARM: CPU	OK
10:11:00	ALARM: CPU	OK
10:11:05	ALARM: CPU	OK
10:11:10	ALARM: CPU	OK
10:11:15	ALARM: CPU	OK
10:11:20	ALARM: CPU	OK
10:11:25	ALARM: CPU	OK
10:11:30	ALARM: CPU	OK
10:11:35	ALARM: CPU	OK
10:11:40	ALARM: CPU	OK
10:11:45	ALARM: CPU	OK
10:11:50	ALARM: CPU	OK
10:11:55	ALARM: CPU	OK
10:12:00	ALARM: CPU	OK
10:12:05	ALARM: CPU	OK
10:12:10	ALARM: CPU	OK
10:12:15	ALARM: CPU	OK
10:12:20	ALARM: CPU	OK
10:12:25	ALARM: CPU	OK
10:12:30	ALARM: CPU	OK
10:12:35	ALARM: CPU	OK
10:12:40	ALARM: CPU	OK
10:12:45	ALARM: CPU	OK
10:12:50	ALARM: CPU	OK
10:12:55	ALARM: CPU	OK
10:13:00	ALARM: CPU	OK
10:13:05	ALARM: CPU	OK
10:13:10	ALARM: CPU	OK
10:13:15	ALARM: CPU	OK
10:13:20	ALARM: CPU	OK
10:13:25	ALARM: CPU	OK
10:13:30	ALARM: CPU	OK
10:13:35	ALARM: CPU	OK
10:13:40	ALARM: CPU	OK
10:13:45	ALARM: CPU	OK
10:13:50	ALARM: CPU	OK
10:13:55	ALARM: CPU	OK
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10:14:30	ALARM: CPU	OK
10:14:35	ALARM: CPU	OK
10:14:40	ALARM: CPU	OK
10:14:45	ALARM: CPU	OK
10:14:50	ALARM: CPU	OK
10:14:55	ALARM: CPU	OK
10:15:00	ALARM: CPU	OK
10:15:05	ALARM: CPU	OK
10:15:10	ALARM: CPU	OK
10:15:15	ALARM: CPU	OK
10:15:20	ALARM: CPU	OK
10:15:25	ALARM: CPU	OK
10:15:30	ALARM: CPU	OK
10:15:35	ALARM: CPU	OK
10:15:40	ALARM: CPU	OK
10:15:45	ALARM: CPU	OK
10:15:50	ALARM: CPU	OK
10:15:55	ALARM: CPU	OK
10:16:00	ALARM: CPU	OK
10:16:05	ALARM: CPU	OK
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10:16:15	ALARM: CPU	OK
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10:16:25	ALARM: CPU	OK
10:16:30	ALARM: CPU	OK
10:16:35	ALARM: CPU	OK
10:16:40	ALARM: CPU	OK
10:16:45	ALARM: CPU	OK
10:16:50	ALARM: CPU	OK
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10:17:00	ALARM: CPU	OK
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10:17:20	ALARM: CPU	OK
10:17:25	ALARM: CPU	OK
10:17:30	ALARM: CPU	OK
10:17:35	ALARM: CPU	OK
10:17:40	ALARM: CPU	OK
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10:18:20	ALARM: CPU	OK
10:18:25	ALARM: CPU	OK
10:18:30	ALARM: CPU	OK
10:18:35	ALARM: CPU	OK
10:18:40	ALARM: CPU	OK
10:18:45	ALARM: CPU	OK
10:18:50	ALARM: CPU	OK
10:18:55	ALARM: CPU	OK
10:19:00	ALARM: CPU	OK
10:19:05	ALARM: CPU	OK
10:19:10	ALARM: CPU	OK
10:19:15	ALARM: CPU	OK
10:19:20	ALARM: CPU	OK
10:19:25	ALARM: CPU	OK
10:19:30	ALARM: CPU	OK
10:19:35	ALARM: CPU	OK
10:19:40	ALARM: CPU	OK
10:19:45	ALARM: CPU	OK
10:19:50	ALARM: CPU	OK
10:19:55	ALARM: CPU	OK
10:20:00	ALARM: CPU	OK

- Main source of events
- Alarms and alarm system must be correct, complete and reliable
- Quality assurance by procedure

Alarm integration procedure



Help Alarm data



Technical Infrastructure Monitoring
HELP ALARM

CERN — European Organization for Nuclear Research

login

System Name	Identifier	Problem Description	Priority
EAU DEMI MEY	FDED-00054 378 0378--	ALARME LAVEUR DE GAZ	2

Alarm Instructions

From 11-JUL-06 **to** 31-DEC-07
source S. Deval **Shift** All

Consigne Pour les interventions pendant les heures ouvrables, contactez Nalco au 74175.

En cas de non réponse, le contractant pour l'opération et maintenance TS-CV (actuellement Cofathec) sera appelé ainsi que Daniel Gros/160992 ou Guillaume Tranchant/75586. En dehors des heures ouvrables, le piquet contractant pour l'opération et maintenance TS-CV sera contacté.

[Add a consigne](#)

[Ins](#)

Action Details

Working Hours Task: Creation bon GMAO

Outside Working Hours Task:
 (1) Intervention operateur Creation bon GMAO
 (2) Appel piquet Creation bon GMAO

[Edit](#)

Cause Details

Description : défaut ventilation ou probleme de configuration de vannes

[Edit](#)

Consequence Details

Description : perte de l' extraction gaz local de stockage

[Edit](#)

Responsible

LastName : GROS

FirstName : DANIEL

CAMMS / Datastream7i

- Used at CERN since ~20 years
- Maintenance management
 - Corrective, Preventive
 - TS groups
 - LHC cryo (being implemented)
 - ~350'000 maintenance objects
- Manufacturing
 - LHC project
 - ~500'000 objects

D7i entities

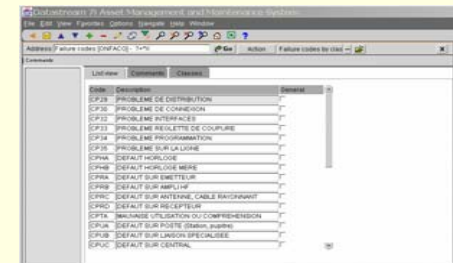
■ Objects

- identifier e.g. SFDEI-00234
- Maintenance responsible (MRC)
- Structured in Systems, locations and equipment
- Links to information such as procedures, spare parts, ..



■ Work orders = Ordres de Maintenance = ODM

- Concern specific objects and MRCs
- Have state
 - “launched” → accepted → finished
 - Comments inserted along with state changes
- Prepared by TI operators on events!



Preparing requests with D7i

Datastream 7i Asset Management and Maintenance System

File Edit View Favorites Options Navigate Help Window

Rapid work order/request entry [WMFLOG] - ?+*

Address Rapid work order/request entry [WMFLOG] - ?+* Go Action

Documents | Comments | Custom fields

List view Record view **Comments** Custom fields

Work order 1245323 **manque tension sur le depart** * ...

Class ...

Priority H ... Safety WO type Correctif Depannage

Warranty Status Lance

Equipment Details

Equipment **EBD3*71** ... P ... Department **ERM** ...

Location 35 ... 35=BATIMENT BUREAUX LABORATOIRES *

Work Order Details

Target date 07-06-2006 Project ...

Problem code ... Cost code ETSO#ST-TFM-EL ...

First activity trade ... Assigned to ...

Originating Details

Requested by 1222 ... PRIMADEI GIACOMO 73166 160 Entered by TCR ...

Shift ... Date/time reported 07-06-2006 11:27

■ OR

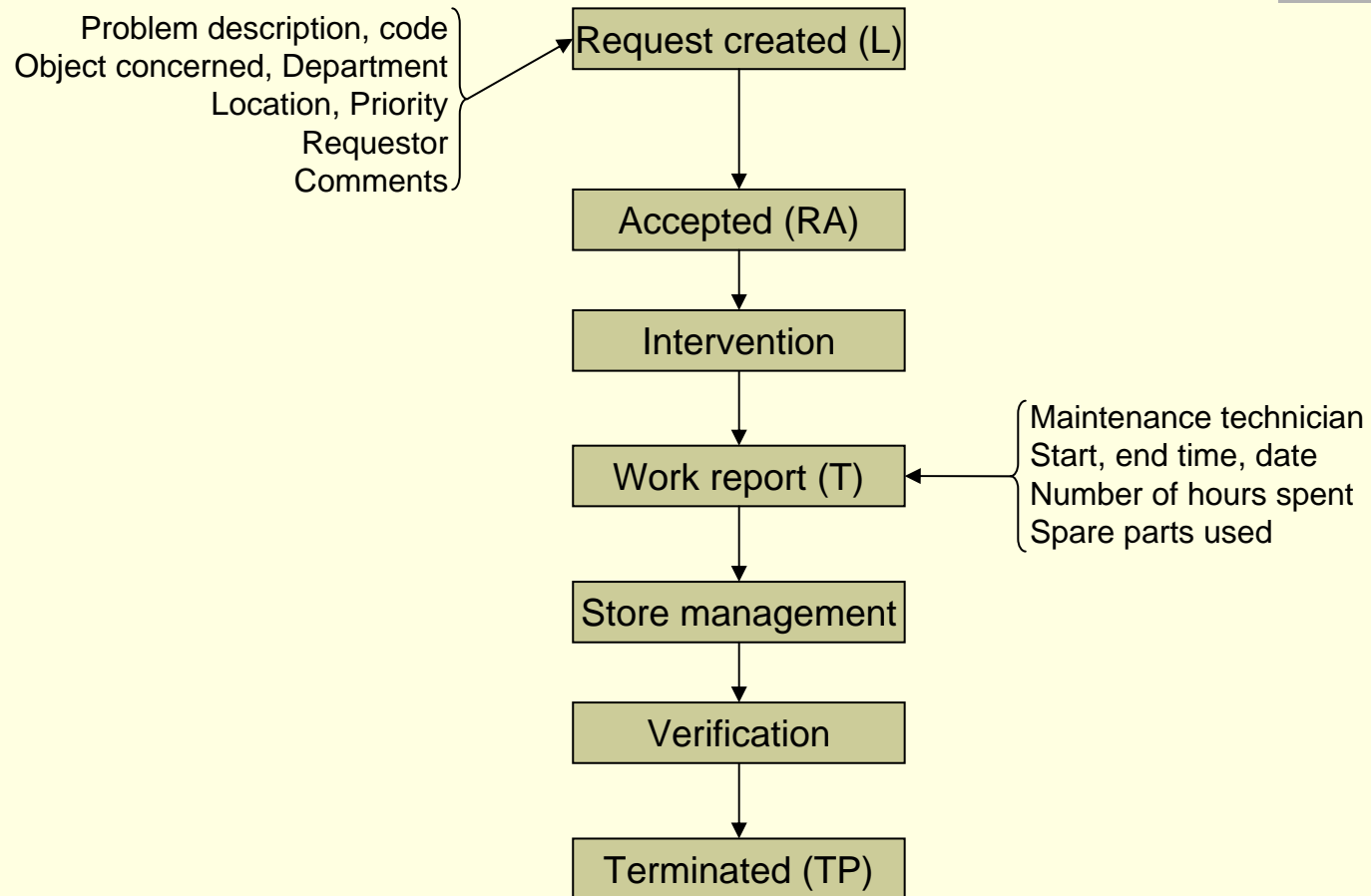
Preparing requests from Alarms

- Request created automatically from alarm or logbook
 - Object, MRC, title pre-filled
 - Operator completes if necessary and sends

The screenshot shows a logbook with several rows of alarm data. A context menu is open over the row: 'R VENT CNG TSG4 1120-R - UAC'. The menu items are: Highlight & klaxon (Ctrl-J), History (Ctrl-H), Details (Ctrl-D), Timestamps, Comment, Multiplicity children, Active multiplicity children, Node children, Active node children, Help in web browser, Make ODM (circled in red), Export alarms, and Test action. The status bar at the bottom of the menu shows 'EAU_DEMI_LHC:FSED-02229:8824'.

Object	MRC	Title
BRUTE	LHC	UW45 2429-R - FUC
DEMI	LHC	UW45 2429-R - FSE
R VENT	CNG	TSG4 1120-R - UAC
R VENT	CNG	TSG4 1120-R - UAC
R VENT	LHC	SHM18 3177-RC- UA

Simplified Workflow



Follow-up of work orders

- What is the state of the request...?
- What was done last time for this problem?
- Are there requests pending acceptance?
- ...

The screenshot displays the 'Datastream 7i Asset Management and Maintenance System' interface. The browser window title is 'Work orders [WM1DE] - ?+'. The address bar shows 'Work orders [WM1DE] - ?+'. The main content area shows a work order record with the following details:

- Work order: 1245323 (description: manque tension sur le depart)
- Equipment: EBD3*71 (TGBT Sous Station 71)
- Project: (empty)
- Department: ERM
- WO type: Correctif Depannage
- Status: Lance

Below the main record, there are tabs for 'WO details', 'Equipment', 'Schedule', 'Service request', and 'Closing'. The 'WO details' tab is active, showing fields for Class, Priority (H), Problem code, Parent work order, Standard WO, Requested by (1222), and PM.

Follow-up with in-house tools

ODM detail - Microsoft Internet Explorer provided by CERN

File Edit View Favorites Tools Help

Google Links

ODM number: 1243157 Status: T. (Termine)

Object: UAMT-01451 Type: CD. (Correctif Depannage) date: 28-05-2006 MRC: [FC02](#)

Description: DEFAULT CLIMATISATION Location: SR2 Standart:

Comments:
 Alarme active en salle de contrôle TI, pour plus d'informations, veuillez composer le 72231
 Fusible HS sur moteur pulsion. Remplacement. Isolement OK. Relancé moteur. Intensité = 63A.

Demandeur: VILLETON PACHOT PATRICK 73780
 TCR Operator: VILLETON PACHOT PATRICK 73780
 Target date: 28-05-2006 Duration: 1
 Creator: [TCR](#) Reported: 28-05-2006 05:55 Start: 29-05-2006 08:00 Completed: 29-05-2006 09:00
 Cause: [*CIN](#) Action: Panne: [FFAE](#) Evenement:

Activities

Code:	5	Trade:	FEM	Task:		Startdate:	05-28-2006	Hours forseen:	0
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Work per activities

Act:	5	Trade:	FEM	MRC:	FC02	Person:	THIELAND CEDRIC DANIEL 7XXXXX 163318		
Hours:	0	Rate:	0	Cost:	0	Entered date:	29-MAY-06	Start date:	28-MAY-06

Audit

From:	R	To:	RA	Date:	29-05-2006 08:24	Modified by:	ACHAUMAY
From:	RA	To:	T	Date:	29-05-2006 14:47	Modified by:	AUTELLETT

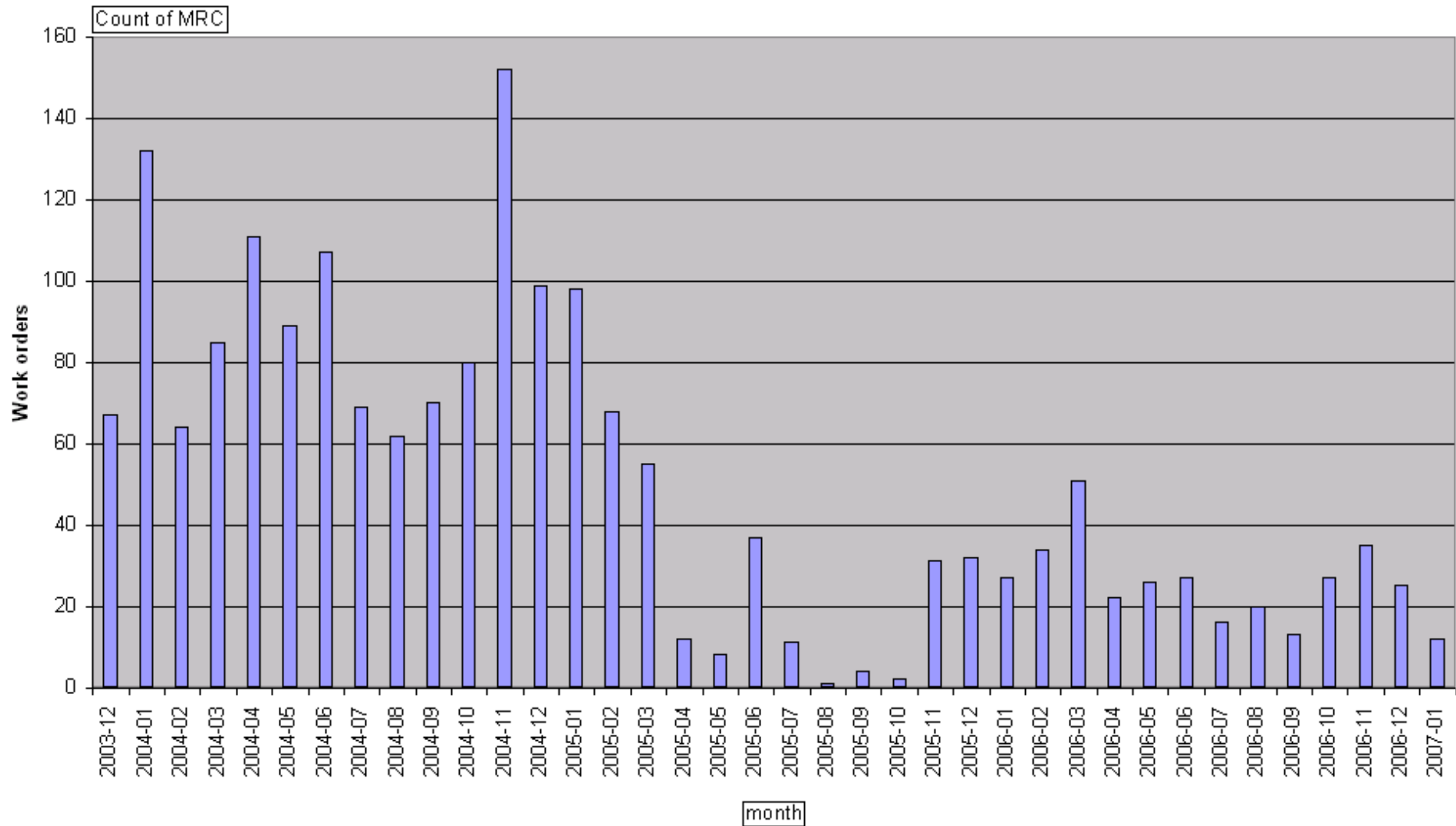
Print

Done

1243158	28/05/2006	UACW2-00522	FCPS	S15	default clima 0515/R- UAPB-005	IP	CD	0
1243162	28/05/2006	F\$FSEG-03585	FCE	SX5	temperature sur eau glacée trop élevé - problème avc l'équipemnt du demandeur.	T	CD	0
Total:								0

Local intranet

Statistics (with TS/CSE web tools)



Some of the **Benefits of these tools**

- For TI operation
 - State of repair request known
 - History of problems available
 - Past problems and solutions at hand
 - Facility to extract statistics
- For equipment groups
 - State of installations relate to number of WO
 - Track maintenance work, delays, repeated repairs, cost, ...
 - Preventive maintenance
- For all
 - Commercial tool with long history at CERN used by staff and contractors
 - Service provided by TS/CSE

Strengths and weaknesses

- No better than its data
 - Equipment-MRC relation not always correct in database
 - Constant effort to keep data entry high quality
- Native Oracle Forms – JInitiator – InternetExplorer
 - Sometimes slow and sensitive to network perturbations
 - Native forms not always optimised for TI use, but...
- Oracle database → open tool
 - Laser integration
 - Create work orders from logbook
 - Web based tools from TS/CSE for free!

Extended use?

- Further integration with HelpAlarm and TI tools
- LHC cryo will use D7i for maintenance
- IT/CS interested for network equipment
- TS/CSE offers a service
 - Available to help setting up a maintenance database for new clients
- AB should benefit



Questions?