

Preliminary discussion on LS3 activities

17th February 2025

Standard maintenance for CMS Gas Systems

Standard maintenance covered by the M&O work-package agreement

- Some activities will require the STOP of the system
 - Activities which require stop of the system will be scheduled in parallel with other activities
 - They will be coordinated with the detector responsible (we will contact them asap)
- Maintenance activities will be schedule from Q3 2026 to ~ Q2 2029
 - Some activities can be done early but others better to do at the end of LS3 (example safety valves checks and MFC calibration)

FSU Manpower:	35 weeks
STAFF Manpower:	52 weeks
System STOP:	3 weeks per system 21 weeks in total

Activity	2019				2020			
	T 1	T 2	T 3	T 4	T 1	T 2	T 3	T 4
Purifier module maintenance								
Mixer module maintenance								
Distribution module maintenance								
Pump module maintenance								
Exhaust module maintenance								
Electrical maintenance								
PLC replacement + Software								
Analysis module maintenance								
General maintenance								

Standard maintenance for CMS Gas Systems

CMS Gas System Standard Maintenance during LS2 per experiment														Responsible	Comment		
Activity	2019				2020				FTE (weeks)				Price FSU (kCHF)			Price Material (kCHF)	
	T 1	T 2	T 3	T 4	T 1	T 2	T 3	T 4	CERN	Mech	Weld/Pipe	Elect	FSU total				
Purifier maintenance																	
cleaning of valves	x	x							2	1			1	2	2	Site responsible	4 purifiers CSC, RPC1, RPC2, CO2 Absorber
modification with manual valves filters bypass	x	x							2		3		3	6	2	Site responsible	5 purifiers to modified CSC, RPC1, RPC2, CO2 Absorber, CF4 Absorber
pressure vessel check & leak test	x	x					x	x	1	1	1		2	4	0	Fred	CSC, RPC2,
replacement of material	x	x					x	x	1	2			2	4	10	Andrea	CSC, RPC1 (SV 2bar), RPC2, CO2 Absorber (SV 2 bar), CF4 Absorber (SV 1 bar)
change of filters	x	x					x	x					0	0	4	Site responsible	CSC, RPC1, RPC2, CO2 Absorber, CF4 Absorber
Mixer maintenance																	
MFC check + recalibration							x	x	2	3			3	6	7	Beatrice/Kacper	
Distribution maintenance																	
flowcell check + calibration						x	x	x	1	1		1	2	4	0	Michal	
check bubblers								x	1				0	0	2	Site responsible	
new 2 racks festo module (RPC, DT, CSC,GEM)									4	6		1	7	14	12	Site responsible	
Filters	x	x	x	x	x	x			3	3			3	6	2	Site responsible	
Check regulation valves									1			1	1	2	0	Site responsible	
Pump maintenance																	
Change of membranes +service							x		4	3	0	0.5	3.5	7	30	Kacper/Site responsible	
Change/add regulation valves	x	x	x	x					1	1	0	0.5	1.5	3	3	Site responsible	RPC Regulation valve
Upgrade filter + pt for DeltaP	x	x	x	x					1	0	1	0.5	1.5	3	2	Kacper/Site responsible	RPC, CSC
Check regulation valves									0.5			0.5	0.5	1	0		
Exhaust module																	
Buffer volumes to be qualified	x	x	x	x					2	1			1	2	0	Fred	RPC, CSC, DT
Upgrade filter + pt for DeltaP							x	x	1		1	0.5	1.5	3	2	Site responsible	
Electrical maintenance																	
Change of power supplies (18 V/ 24 V)	x	x	x	x					1	1	0	1	2	4	30	Lukasz/Patrick	15 pcs
Canbus quality			x	x					0.5	0	0	0	0	0	0	Michal	
Profibus quality	x	x	x	x					0.5	0	0	0	0	0	0	Patrick	
Check/repair connectors	x	x	x	x					2	0	0	1	1	2	1.5	Patrick	
Heating cables purif + bloc regul.	x	x	x	x					1	0	0	1	1	2	0	Patrick	
PLC replacement + Profibus separation (With quality check)	x	x	x	x					2	0	0	2	2	4	40	Michal	8 pcs: DT,CSC,RPC,GEM,T1,RECOVERY,MIXER SXS, AUX
Analysis																	
Check/change of analysis devices				x	x	x			0.5	0	0	0.2	0.2	0.4	2.5	LPh/Site responsible	CSC H2O to change, DT to modified O2 and H2O to change (40KCHF to maintain)
Calibration of all analysis devices							x	x	1	0	0	0	0	0	1.5	LPh/Site responsible	Chemical cells to change
Manifold analysis					x	x	x	x	0.4	0	0	0	0	0	1	LPh/Site responsible	LS2 to check, LS3 to replace
General																	
Pressure sensors: change/calibration	x	x	x	x					1	1		1	2	4	6	Beatrice/Site responsible	PT Atmospherique (1000CHF 2PT + 2 Afficheur)
Check/repair pneumatic valves	x	x	x	x	x	x			1	1	0	0	1	2	2	Site responsible	
Check/repair electro valves	x	x	x	x	x	x			1	0	0	1	1	2	2	Site responsible	
Check all bubblers							x		0.5	0	0	0	0	0	1	Site responsible	
Check/calibrate safety valves							x	x	1	1	1	0	2	4	1	Site responsible	
System Commissioning									15	0	0	0	0	0	0	Michal/Site responsible	As stated in Michal list 2week per Big/med system 1 per small. Plus 2 weeks of s
Krohne			x	x	x	x			1	0.5	0.5	0	1	2	4	Kacper	Exhaust CSC, RPC
									Total	Total	Total	Total	Total	Total	Total		
									56.9	26.5	7.5	12.7	46.7	93.4	170.5		

- We will prepare similar table to share with you

Upgrades

GEM: ME0 gas system

- Distribution module: 2 new racks
 - 60 kCHF
- ANALYSIS: request to have regular O₂/H₂O monitoring at the output of both endcaps
- ANALYSIS: request to have GC analysis at the output
 - Proposal: to use the the same GC of DT

Flushing system

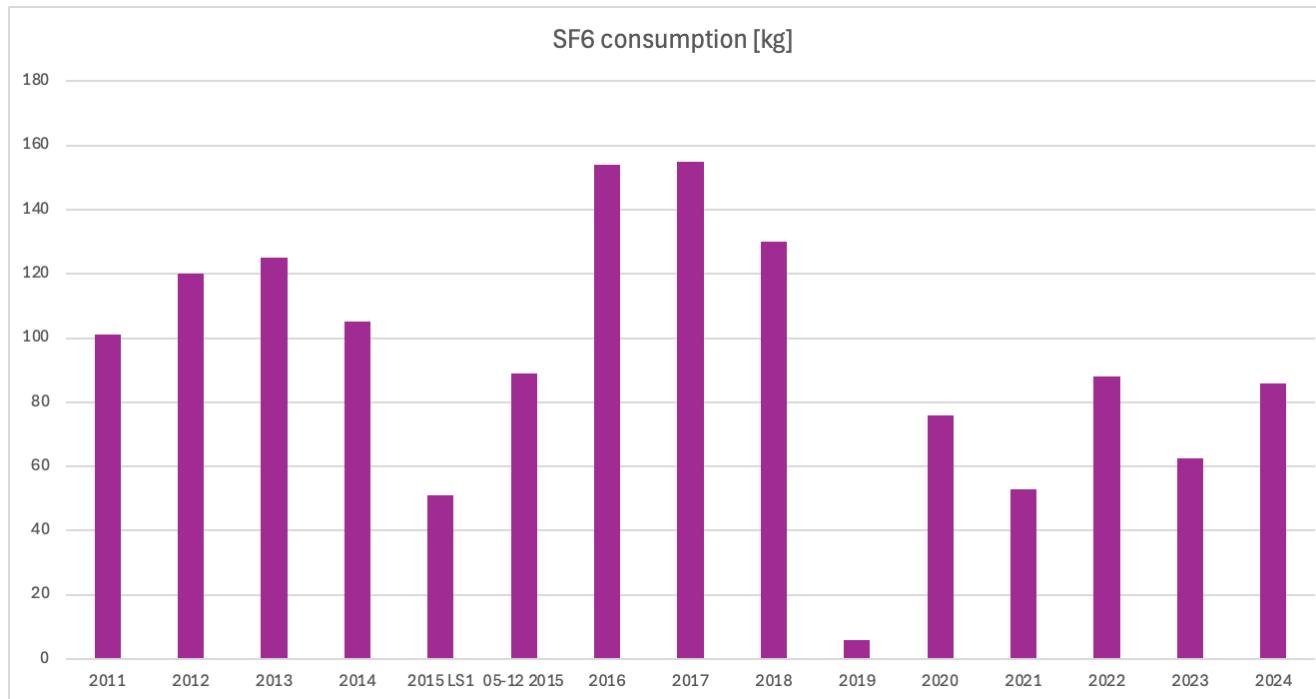
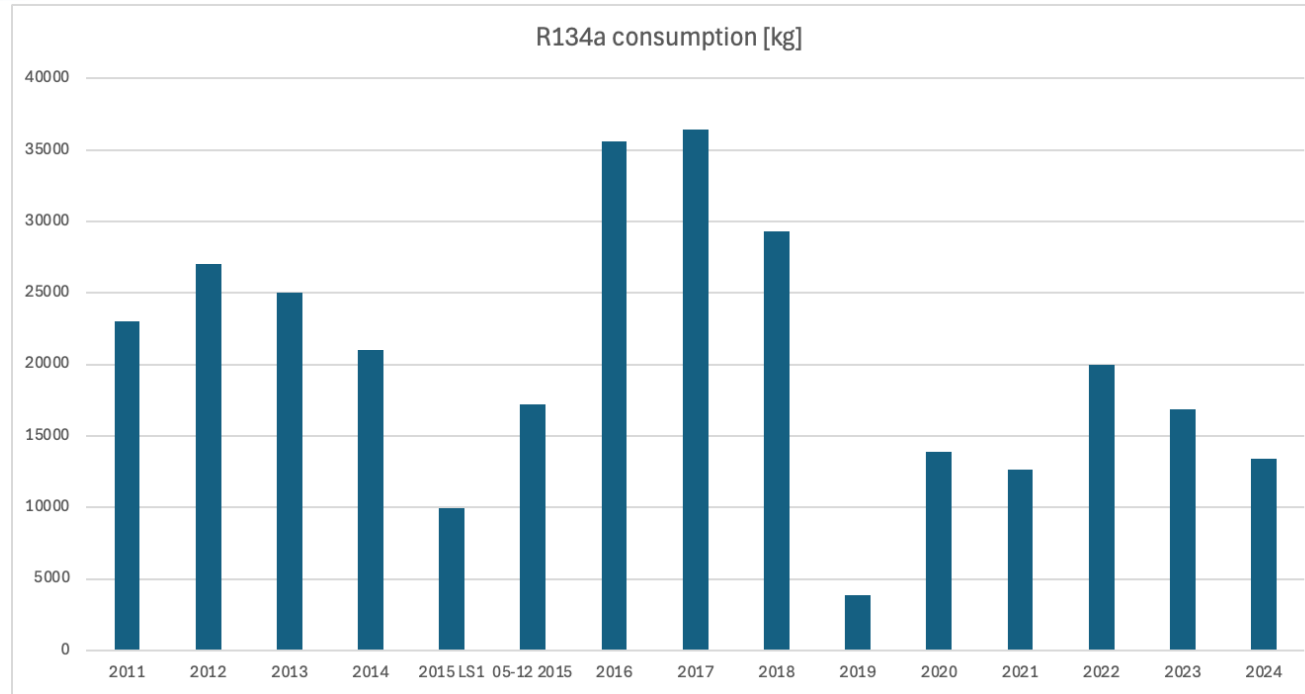
- Refurbishment/upgrade of flushing system in USC55
 - Discuss already started:
[https://indico.cern.ch/event/1418392/contributions/5962207/attachments/2859112/5001684/WP EP-DT-FS preliminary inputs.pdf](https://indico.cern.ch/event/1418392/contributions/5962207/attachments/2859112/5001684/WP_EP-DT-FS_preliminary_inputs.pdf)
 - Final design to agree and workpackage to prepare

General

- **ELMB/PLC: upgrade**
 - Upgrade for all gas systems
- **SOFTWARE: some upgrades needed**
 - Software regeneration and new commissioning
- **GAS SUPPLY BE-EA: refurbishment of gas panels**
 - Schedule still to be provided but we will try to coordinate the activities if gas system will have to run
- **What will be the gas system status during LS3?**
 - On? Off? for how long? What gas mixture? etc.
 - Some infos provided in TIG meeting May 2024: are these still up-to-date?
 - We need inputs from detector people —> we will contact them asap
- **We have to coordinate gas system maintenance and upgrades for four experiments**
 - We're collecting inputs
 - We will try to follow experiment schedule when possible

Please let us know of possible upgrades of existing detectors or new systems

Gas consumption



Gas consumption

