### MOPMS016

Interlocks Controls Monitoring

# THE CONTROL SYSTEM OF CERN ACCELERATORS VACUUM [CURRENT STATUS & RECENT IMPROVEMENTS]

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### Abstract

The vacuum control system of most of the CERN accelerators is based on Siemens PLCs and on PVSS SCADA

After the transition from the LHC commissioning phase to its regular operation, there has been a number of additions and improvements to the vacuum control system They were driven by new technical requirements and by feedback from the accelerator operators and vacuum specialists

New control functions have been implemented in the PLCs. New tools have been developed for the SCADA, while its ergonomics and navigation have been enhanced





**VPI** : power supplies on remote-IO stations (Siemens-ET200)

Master\_PLC, controllers, power supplies - kept in underground service areas away from the accelerator tunnels where radiation would eventually damage them

## in the tunnel

**VGF** : "active" pair of VGR+VGP, with front-end electronics nearby in tunnel where radiation low, and distance to a service area large **VGR** and **VGP** closer to the protected areas can be directly accessed by a remote TPG **Mobile Profibus** : dynamically network for "mobile" equipment (when the machine is stopped) **VPGM** : mobile pumping groups, with "Slave" PLC S7-200 **VREM** : mobile bake-out stations, with "Slave" PLC S7-300





### **PLC** new features

#### auto-restart of VPGF

The control of the pumps and valves results from a logic combination of status inputs After a power failure, status inputs are lost and the group has to be restarted manually palliative solution:

cyclic memorisation of the status inputs

detection if the power of the group was off and back again

try to automatically restart, taking into account the memorised status inputs

completely new approach, under development in parallel:

- using sequential state machine
- outputs of the function depend only on the current state of the machine, not on the status inputs state is the memorised resultant of the sequence of previous states and inputs at any time it will be easy to restart from the memorised state

#### **Mobile Profibus**

automatic recognition and integration of slave PLCs into the mobile Profibus has been extended for quick installation of mobile pumping groups, with the electronics kept in radiation-free zones to tackle unexpected leaks in the insulation vacuum

LSSV7 LSSV8 12.M I SOL	.8.8 .8.R .8.B .8.R	Ion pumps Mobile pumping groups Gauges of mobile pumping gr	3 YES 2 2
Device	Sector	State	Value
VGR.484.33R4.M	A31R4.M	ON	4.95E-
VGR.502.32R4.Q	E45.Q	ON	4.95E-
VGR.501.34L5.Q	E45.Q	ON	4.95E-
VGR.487.34R4.M	A31L5.M	ON	4.95E-
VGR.523.31L5.M	A31L5.M	ON	1.10E-
VGR.503.32L5.Q	F45.Q	ON	4.95E-
VGR.501.28L5.Q	F45.Q	ON	4.95E-
VGR.517.28L5.M	A27L5.M	ON	4.95E-
VGR.517.26L5.M	A23L5.M	ON	4.95E-
VGR.503.24L5.Q	G45.Q	ON	1.21E-
VGR.501.20L5.Q	G45.Q	ON	7.82E-
VGR.519.23L5.M	A19L5.M	ON	8.00E-
VGR.517.20L5.M	A19L5.M	ON	1.69E-
VGR.517.18L5.M	A15L5.M	ON	6.09E-
VGR.503.16L5.Q	H45.Q	ON	4.95E-
VGR.501.12L5.Q	H45.Q	ON	8.00E-
VGR.519.15L5.M	A11L5.M	ON	1.59E-
VGR.517.12L5.M	A11L5.M	ON	4.95E-
VGR.373.10L5.M	A7L5.M	ON	8.00E-
VGR.342.8L5.Q	145.Q	ON	8.00E-
VGR.10.3L5.Q	145.Q	ON	8.00E-
VGR.243.6L5.M	A6L5.M	ON	8.00E-
VGR.201.5L5.M	A5L5.M	ON	8.00E-

#### Save Save VMR - Vacuum Monitoring Room

four 3-screen stations directly on the technical network four wall-screens running the web summary pages

**PSR and AD** - although still on the previous generation of control architecture, they are now available for monitoring on PVSS (accessed through CMW)

tools configuration - the users can define and save the full details of their own email/SMS notifications

historical trends

device list

#### VGR.944.4L5.M VGR.10.3L5.M Conclusions -Interval Selection -

From: 07-10-201 121 New functions have been implemented in the PLC and PVSS -Show history-

Value State The ergonomics and configurability of the PVSS application have been enhanced

There is still a long way ahead, regarding

the homogenisation of equipments and controls across machines

the convergence towards UNICOS

the tools for tracking of events, interventions and repairs

My confid	acrime r aurations		Filter	Eilter a	active
Owner	, Group	Configuration	Error	State	Messages
gomes		aesffas		Inactive	0
bhenrist	<b>N</b>	avgTemp		Running	0
dcalegar		BGI Pe dome OFF		Running	0
dcalegar		BGI Pe groupe		Running	0
dcalegar		BGI V6 ouverte		Running	0
bhenrist	V	BSinlet		Running	7
bhenrist	V	BSoutlet		Running	6
Imourier		CRYO VACOK		Running	20
bhenrist		Fermeture individuelle des vannes LH		Inactive	0
bhenrist		Jauge test		Inactive	0
bhenrist		LBV LHC VAC interlock		Inactive	0
bhenrist		LBV Penning 1-2 cryo		Inactive	0
bhenrist		LBV PR source lost		Inactive	0
bhenrist		LBV Valves 1-2 cryo PR source lost		Inactive	0
bhenrist		Ligne dump Penning		Inactive	0
bhenrist		Ligne dump VPI pour Tony		Running	0
bhenrist		Penning Alarmes		Inactive	
Imourier		penning cryo > 5e-5 mbar		Running	
Imourier		Penning sect 3-4 Leak A27L4.M > 3e		Running	