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Why we need OT-OT and OT-IT convergence and how we reach it?

together with our partner company for Benelux

Prokorment
VERTROUWEN IN PRAKTIJK

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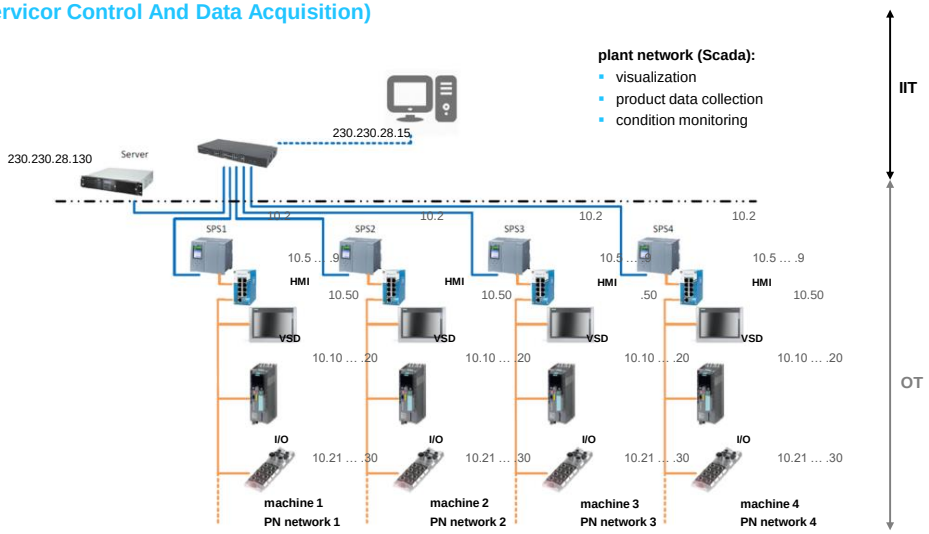
Customer project with 4 PLC's with PN network and a Scada network

(SCADA – Supervicor Control And Data Acquisition)

plant network (Scada):
- visualization
- product data collection
- condition monitoring



Network engineering effort?

Project with 4 PN machine networks (50-70 devices per network) and a Scada network above the machines for Process control, Process visualization, production data collection (later also Condition Monitoring Applications).

*** PLC and Process control/visualization programming:**
350 h a. 100 €/h = 35.000 €
*** Network design (PROFINET and Scada):**
100 h a. 100 €/h = 10.000 €

The network engineering part in such projects is approximately 20-30% compared with the PLC engineering part!

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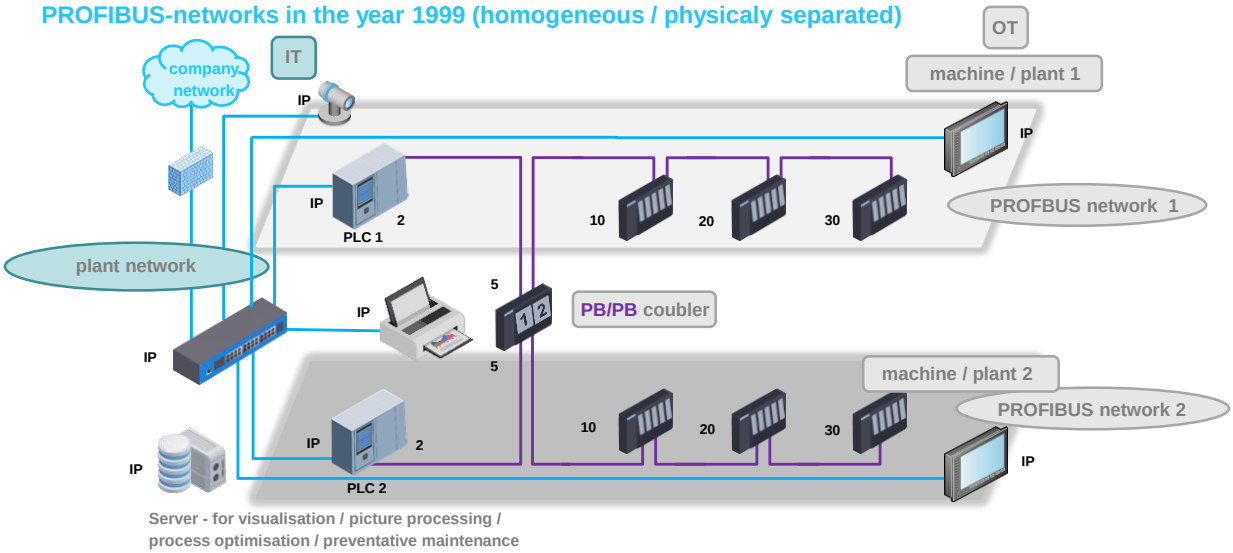
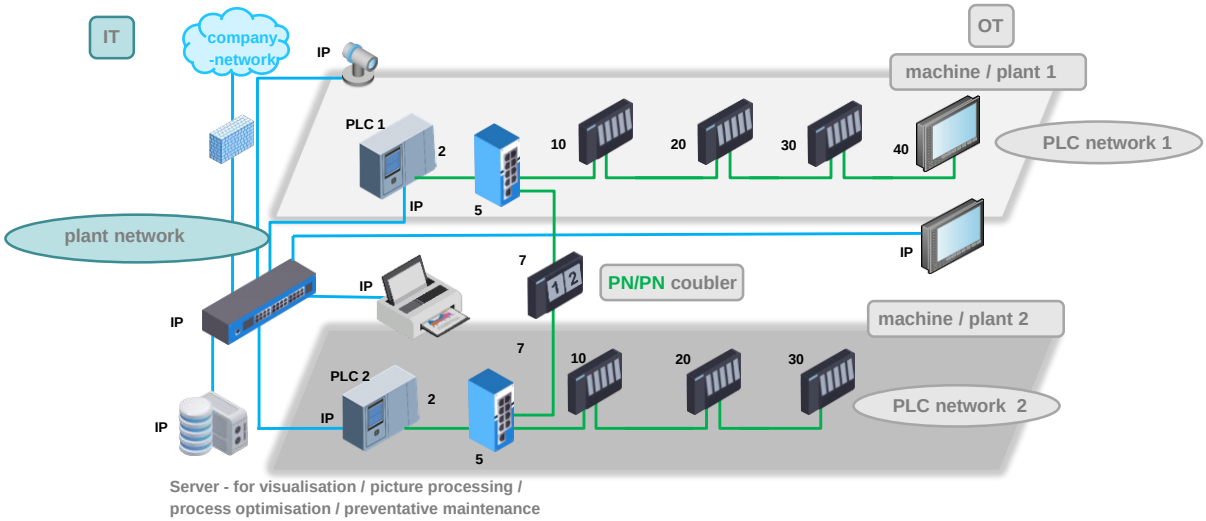
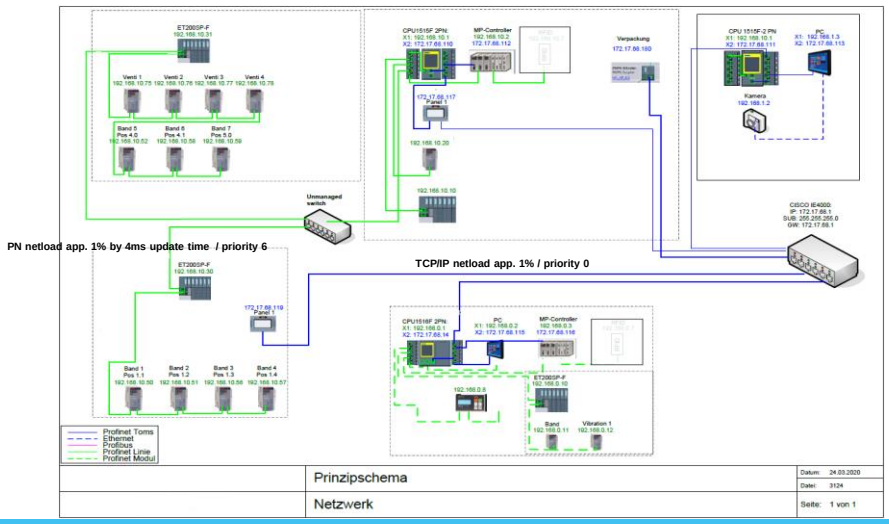
PROFIBUS-networks in the year 1999 (homogeneous / physicaly separated)



PROFINET-networks in 2006 (homogeneous / pysicaly separated)



PROFINET-networks today 2022
(after 16 years PROFINET / 90% homogeneous / physicaly separated)



3 x PN network
1 x plant network (Scada)

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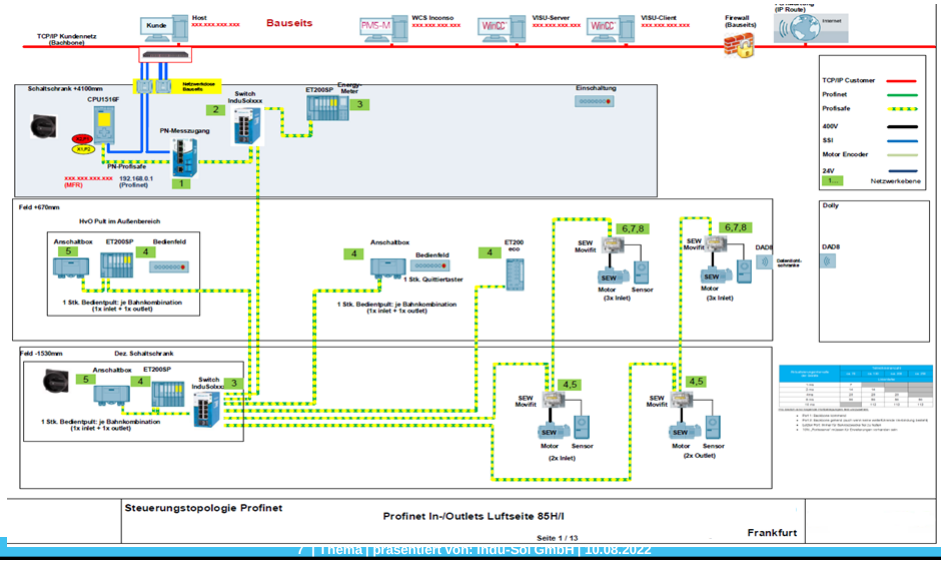
PROFINET-networks today 2022
(after 16 years PROFINET / 90% homogeneous / physicaly separated)



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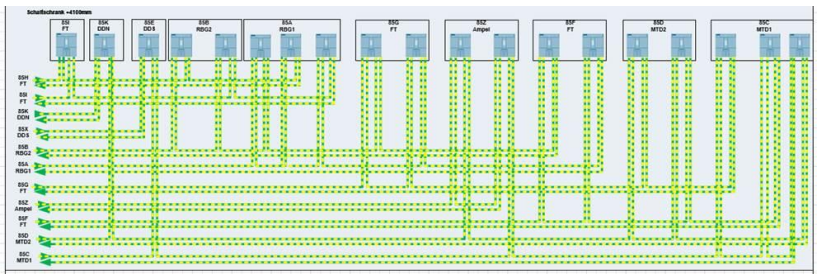
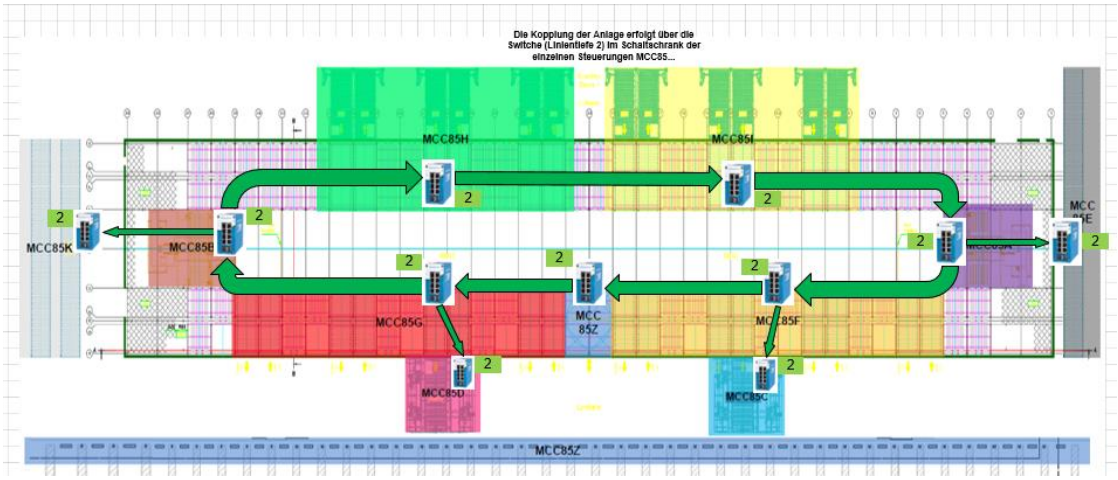
PROFINET-networks today 2022
(after 16 years PROFINET / 90% homogeneous / physicaly separated)



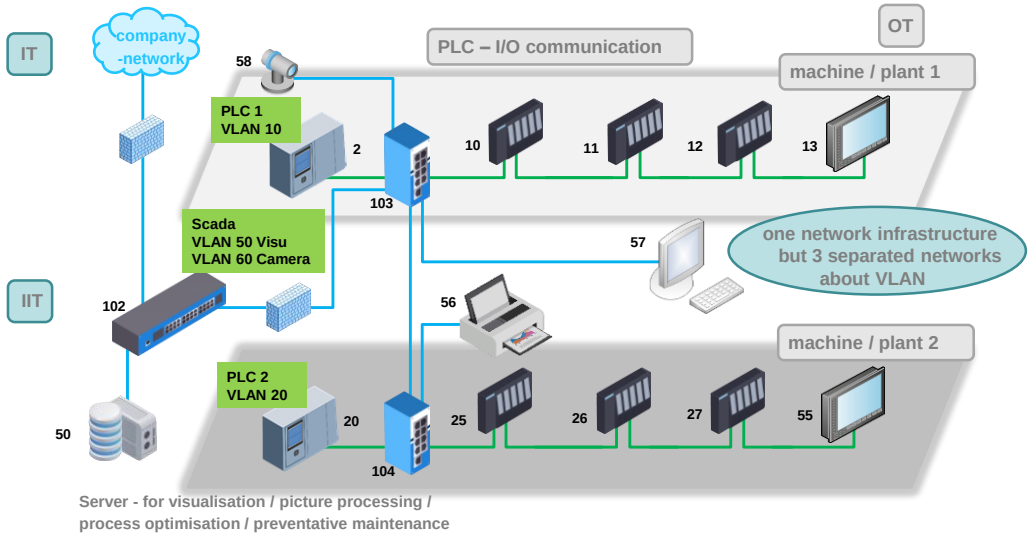
Prüfung mit Lufthansa!

	85H	85I	85K	85E	85B	85A	85G	85Z	85F	85D	85C
85H		x			x	x					
85I	x				x	x					
85K										x	x
85E										x	x
85B	x	x				x	x		x		
85A	x	x			x		x		x		
85G					x	x				x	x
85Z										x	x
85F					x	x				x	x
85D			x	x			x	x	x		x
85C			x	x			x	x	x	x	

PROFINET-networks now in the project (heterogeneous OT-OT and convergent OT-IT (Scada)



PROFINET-networks tomorrow (heterogeneous/convergent VLAN - virtuell separated and firewall protected)



Let us come back to today and 90% homogeneous networks.

*** How we do depict/plan our homogeneous networks today?**
*** Do these tools support or hinder the network designer to plan heterogeneous/convergent networks from tomorrow?**

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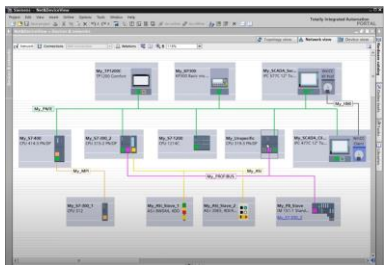
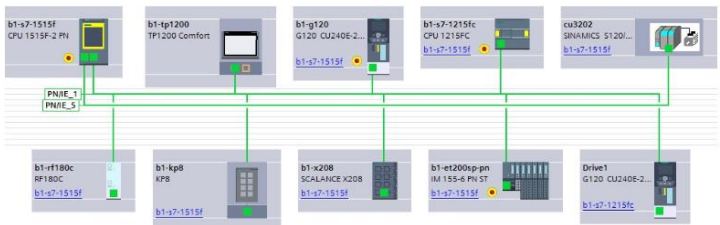
Network „planning“ example with TIA-Portal (enogh for homogenous networks)



But what do you have planned?

- netload planning
- port assignment at the switches
- passiv infrastructure like patchfields
- cable lenght in the project
- installation costs calculation
- switch backplane capacity
- switch throughput
- VLAN planning



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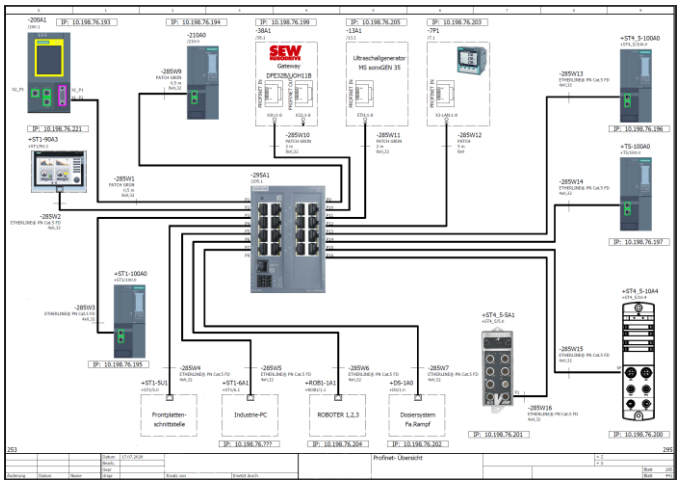
Network „planning“ example with E-PLAN (enogh for homogenous networks)



But what do you have planned?

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- cable lenght in the project
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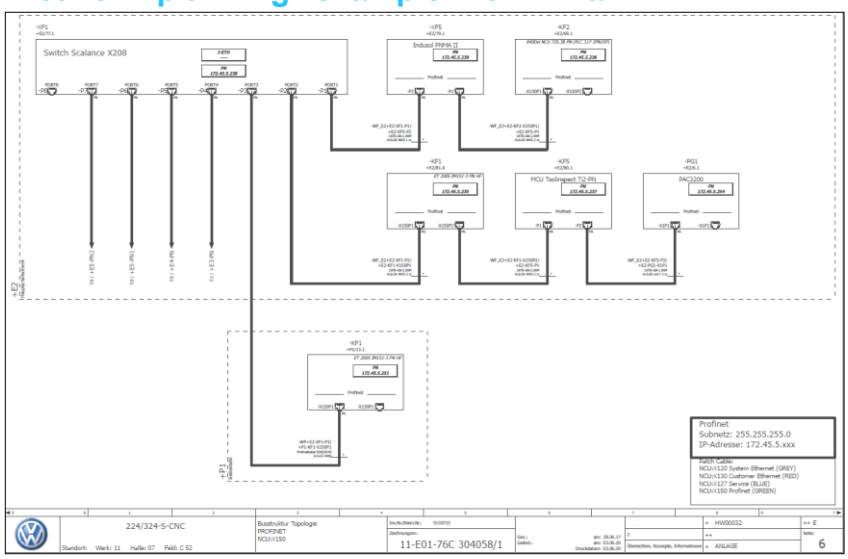
Network“planning“ example with E-Plan



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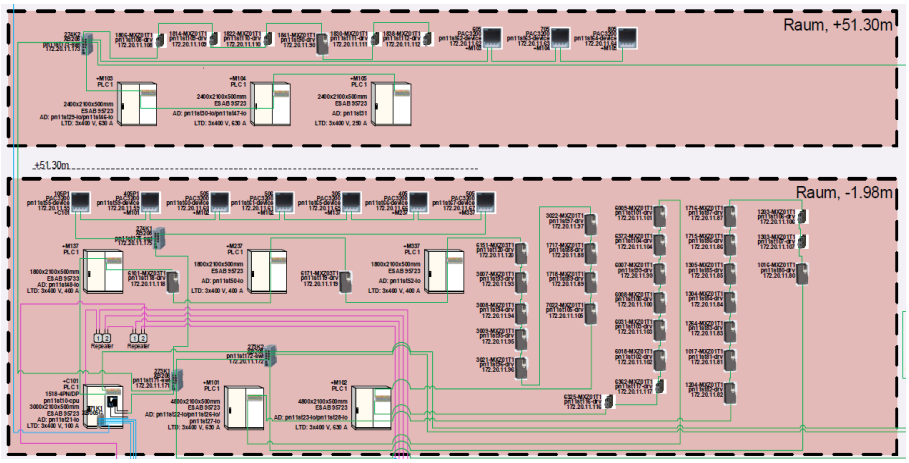
Network „planning“ example with MS-VISIO (hight effort but enogh for homogenous networks)



But what do you have planned?

- netload planning
- port assignment
- line depth
- switch backplane capacity
- switch throughput
- VLAN planning

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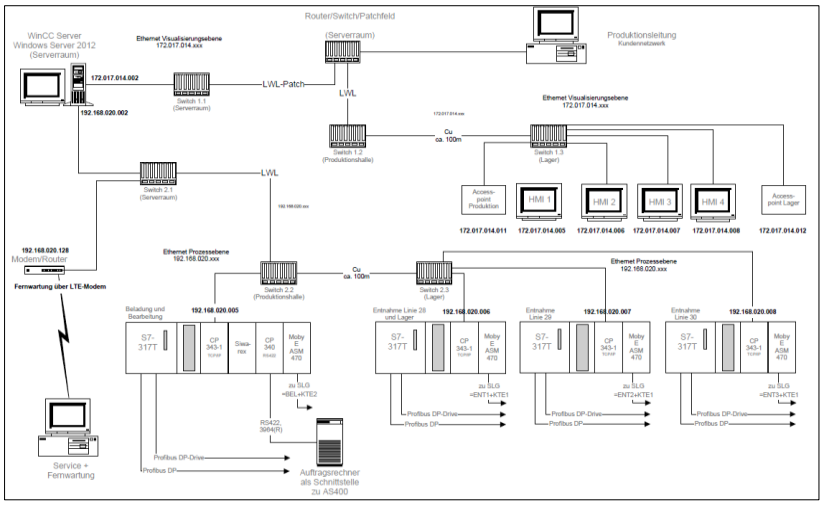
Network„planning“ example with MS Visio (not more as a drawing)



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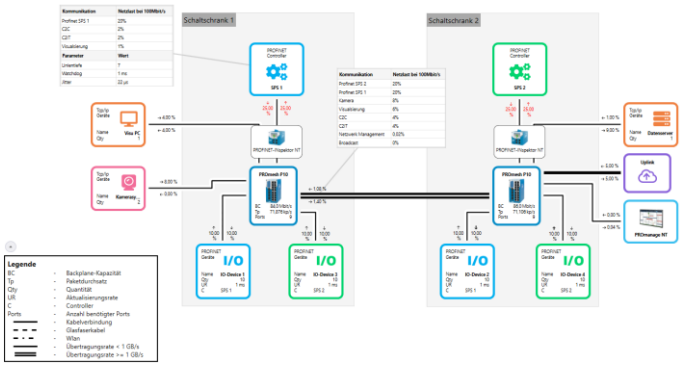
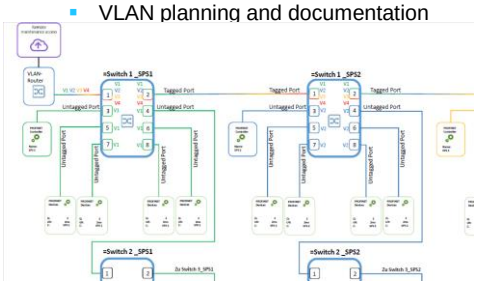
Network planning example with PROnetplan V2

NETZWERK PLANUNG



Beside the network topology drawing, you have included:

- netload planning
- line depth
- port assignment
- network parts list
- passive infrastructure
- project costs calculation
- switch backplane capacity
- switch throughput
- VLAN planning and documentation



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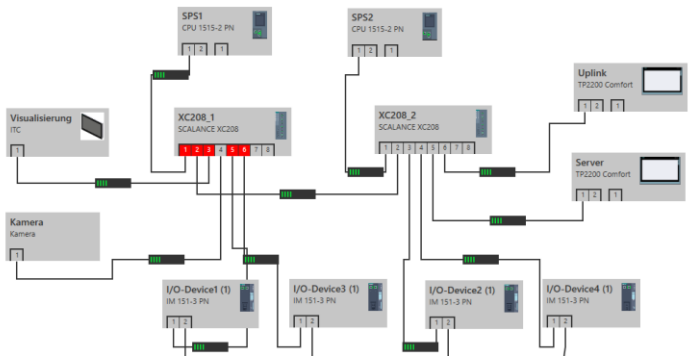
Network planning example with SINETPLAN V2



So far so good, but…. !

"Nobody needs heterogeneous networks at the OT level!"

"We separate our OT networks physically to avoid operation problems, or fulfill security requirements!"

"To save money is not the main question in our projects"

"But be aware PLC programmer!"

A simple homogeneous designed network project can quickly become a complex one! And then perhaps at the commissioning side, under commissioning conditions!

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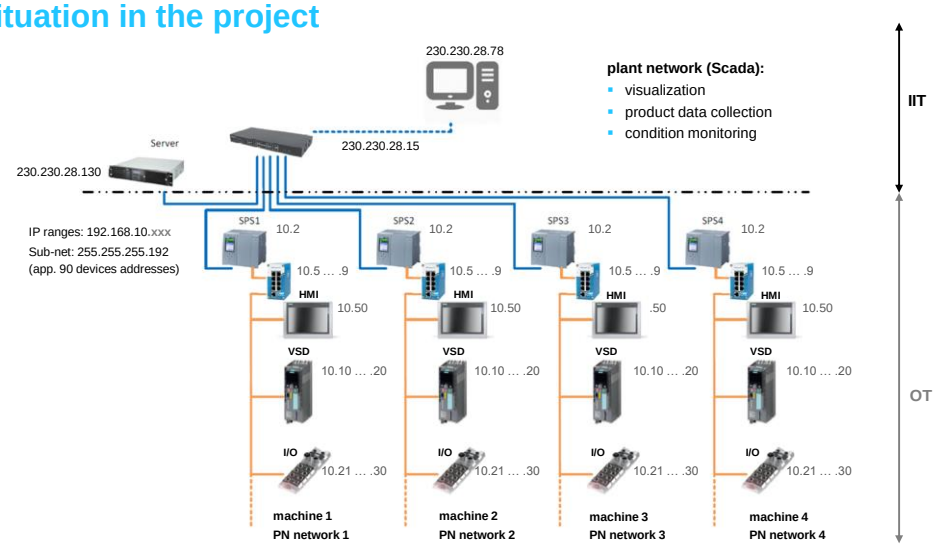
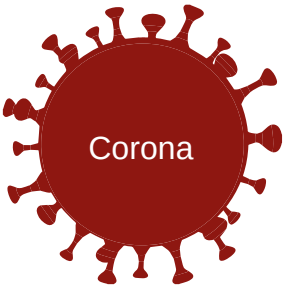
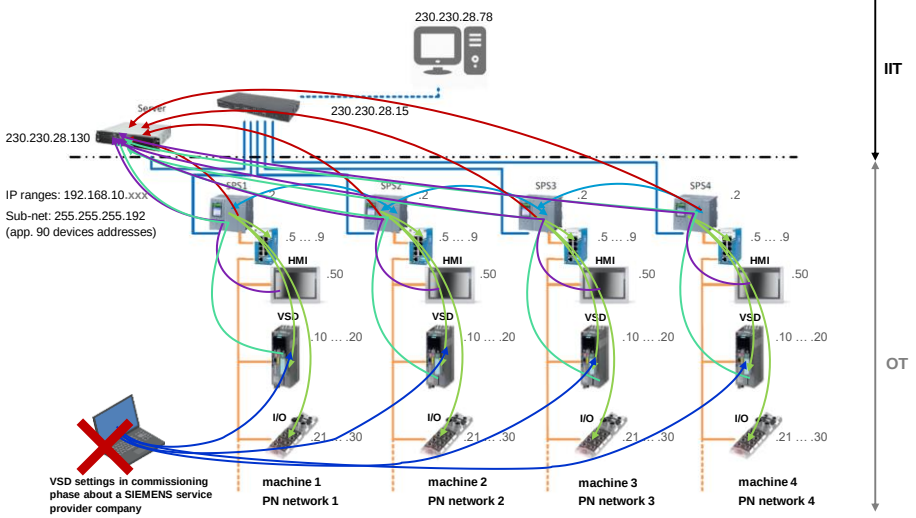
Starting situation in the project



Communication relations





communication relations:

- PROFINET – RT
  - SPS 1 … 4 ↔ devices
- TCP – IP
  - SPS ↔ SPS (plant network)
  - SPS 1 … 4 ↔ Server (plant network)
  - HMI ↔ Server (about the PLC)
  - VSD ↔ Server (about the PLC)
  - PC ↔ VSD

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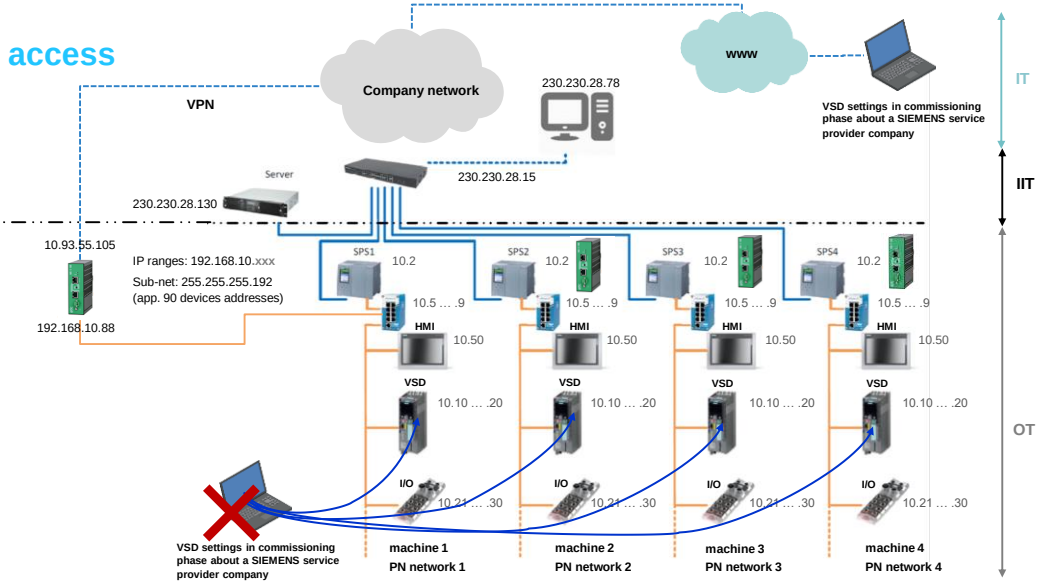
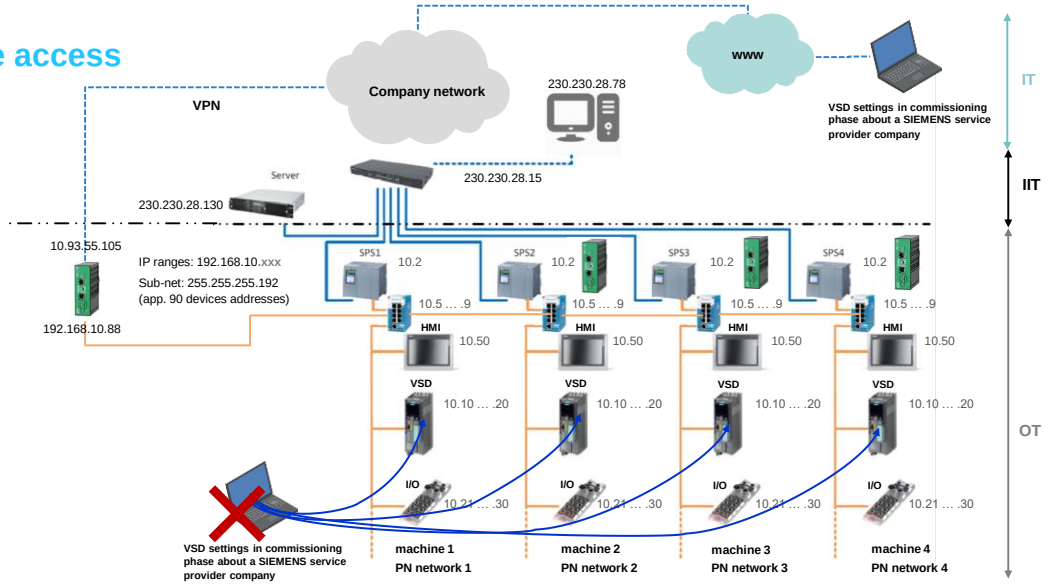
Remote access



Remote access



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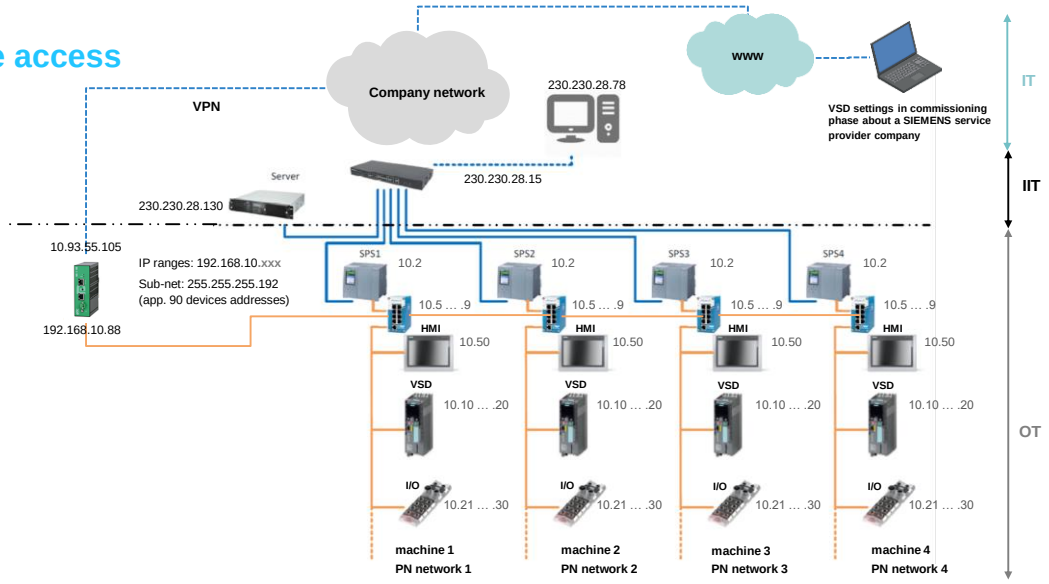
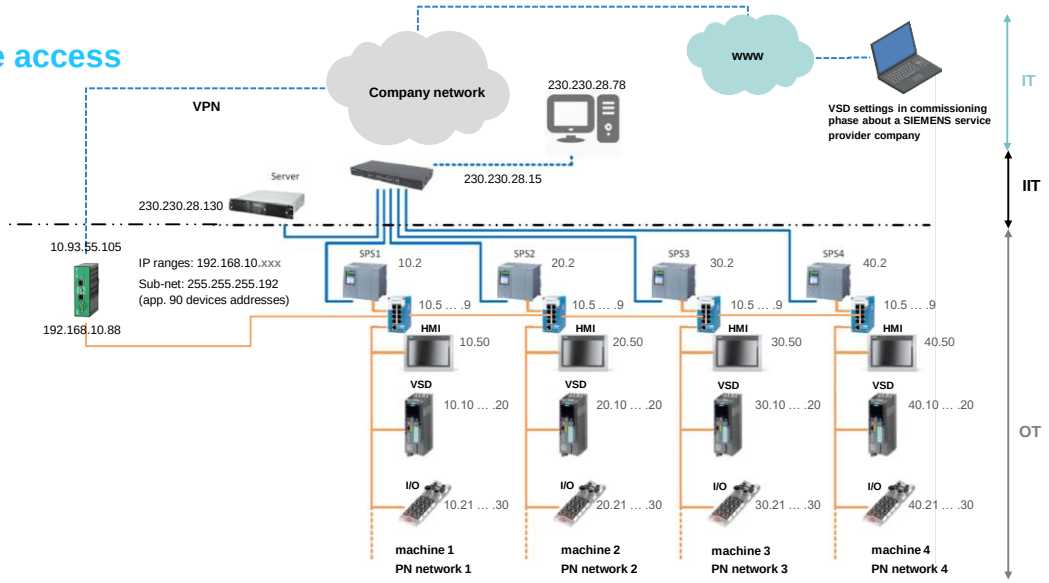
Remote access



Remote access



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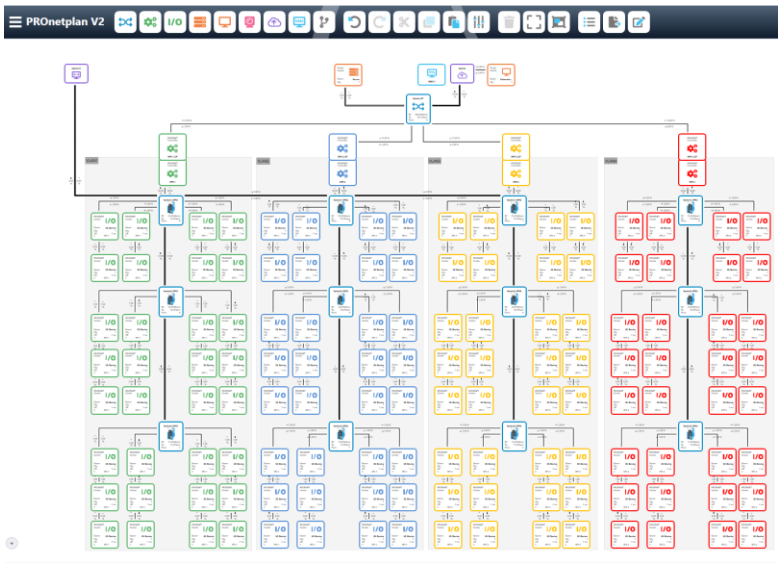
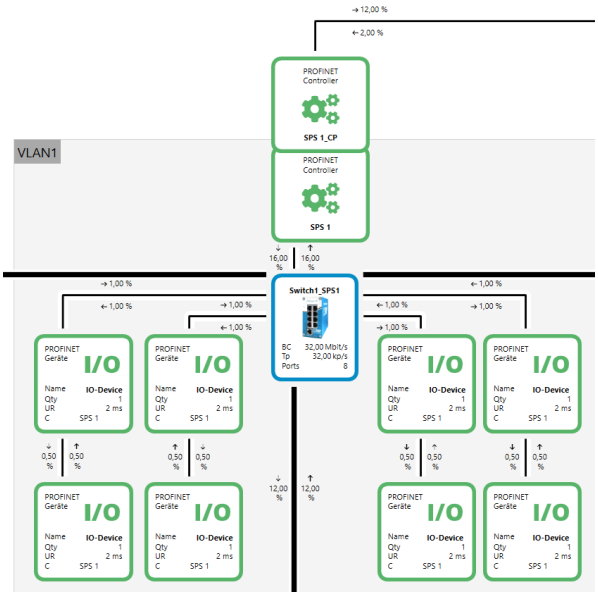
PROnetplan V2



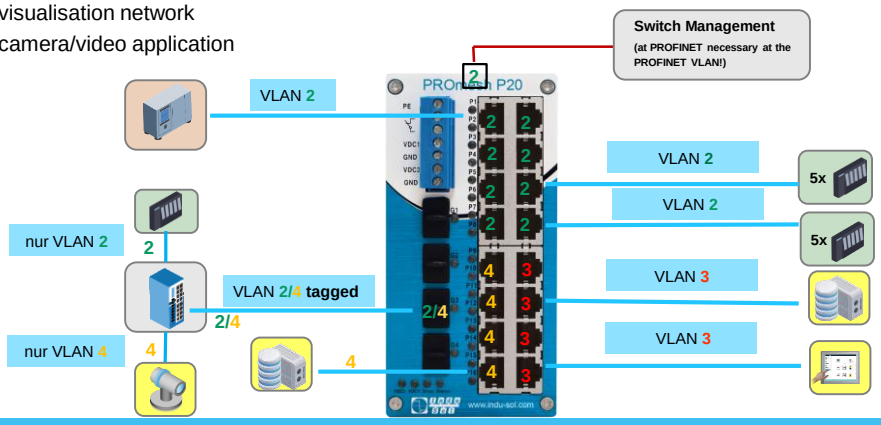
PROnetplan V2



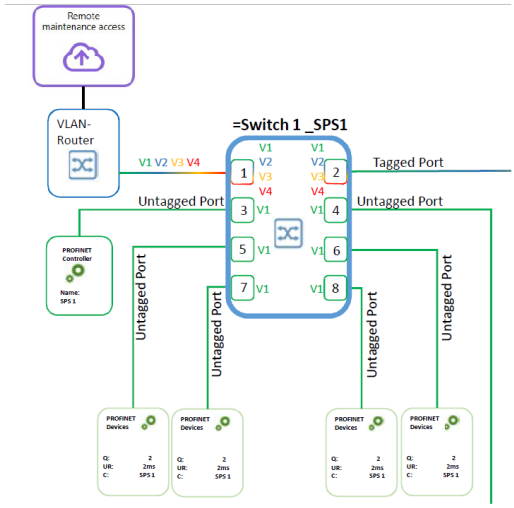
Logical separation about VLAN

port specific separation:

+ **VLAN 2** time critical daten PROFINET
+ **VLAN 3** visualisation network
+ VLAN 4 camera/video application



Result of VLAN planning with PROnetplan V2



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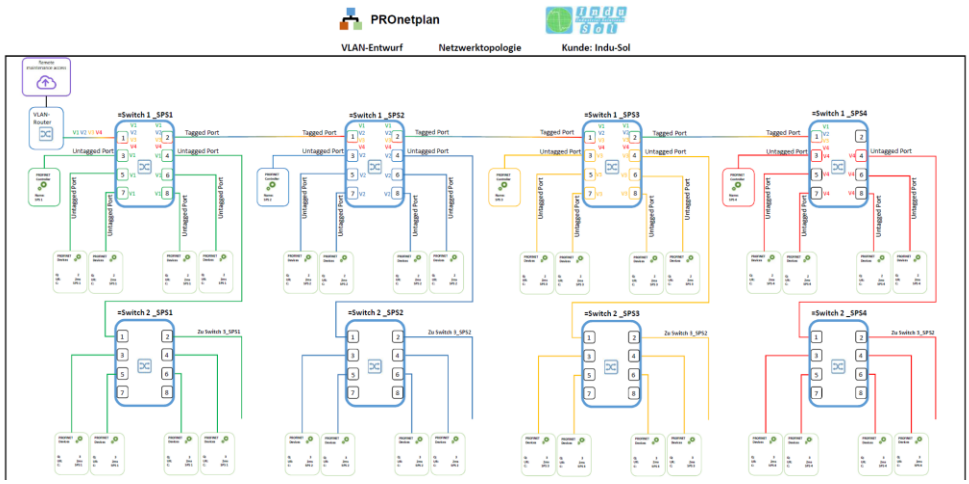
Result of VLAN planning with PROnetplan V2



Result of VLAN planning with PROnetplan V2

Switch/VLAN		VLAN 1	VLAN 2	VLAN 3	VLAN 4
Switch 1_SPS1	Tagged Port	1 und 2	1 und 2	1 und 2	1 und 2
	Untagged Port	3 – 8			
Switch 1_SPS2	Tagged Port	1 und 2	1 und 2	1 und 2	1 und 2
	Untagged Port		3 – 8		
Switch 1_SPS3	Tagged Port	1 und 2	1 und 2	1 und 2	1 und 2
	Untagged Port			3 – 8	
Switch 1_SPS4	Tagged Port	1 und 2	1 und 2	1 und 2	1 und 2
	Untagged Port				3 – 8
Switch 2_SPS1	Tagged Port	Keine VLAN-Planung			
	Untagged Port				
Switch 2_SPS2	Tagged Port	Keine VLAN-Planung			
	Untagged Port				
Switch 2_SPS3	Tagged Port	Keine VLAN-Planung			
	Untagged Port				
Switch 2_SPS4	Tagged Port	Keine VLAN-Planung			
	Untagged Port				

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Result of an network planning software (like PROnetplan)

- **part lists for active an passiv infrastructure**
- **switch port assignment**
- **VLAN configuration and summulation**
- **Price calculation**
- **Cable lists**

Geräteliste

		Name	Angeschlossenes Gerät	Übertragungsmedium	Übertragungsrate	Kabeltyp	Kabellänge (ca.)	Steckertyp
+		SPS Wandresbürste	2 Geräte	Kupfer	100 Mbit/s	Cat. 6A	Max. 25 m	RJ45
+		SPS Palettenwandler	2 Geräte	Kupfer	100 Mbit/s	Cat. 6A	Max. 40 m	RJ45
+		SPS Wemhöner FP	2 Geräte	Kupfer	100 Mbit/s	Cat. 6A	Max. 20 m	RJ45
+		SPS Wemhöner FS	2 Geräte	Kupfer	100 Mbit/s	Cat. 6A	Max. 20 m	RJ45
+		SPS Wemhöner PPW	2 Geräte	Kupfer	100 Mbit/s	Cat. 6A	Max. 50 m	RJ45
+		SPS Presse	2 Geräte	Kupfer	100 Mbit/s	Cat. 6A	Max. 20 m	RJ45
+		SPS Blechwechsel	2 Geräte	Kupfer	100 Mbit/s	Cat. 6A	Max. 20 m	RJ45
+		SPS Anthon VP	2 Geräte	Kupfer	100 Mbit/s	Cat. 6A	Max. 15 m	RJ45
+		SPS Anthon RP	2 Geräte	Kupfer	100 Mbit/s	Cat. 6A	Max. 15 m	RJ45
+		SPS Thermalöl	2 Geräte	Kupfer	100 Mbit/s	Cat. 6A	Max. 45 m	RJ45
+		PROmesh P28-1	23 Geräte	Kupfer, LWL	100 Mbit/s, 1 Gbit/s		Max. 65 m	RJ45
−		PROmesh P28-1.1	21 Geräte	Kupfer	100 Mbit/s, 1 Gbit/s	Cat. 6A	Max. 75 m	RJ45, LC
		Port 1	PROmesh P28-1	Kupfer	1 Gbit/s	Cat. 6A	2 m	RJ45
		Port 2	- Frei -					
		Port 3	Controller Wandresbürste	Kupfer	100 Mbits/s	Cat. 6A	15 m	RJ45

CINI4.0

cornet

Remote Access:

for machine builder for commissioning, operator support and troubleshooting is one example why we need OT-OT and OT-IT network convergence.

Shopfloor digitalization:

digitalization activities of the end users, in order to "condition monitoring" for preventative maintenance and maintenance on demand purposes is another example for connectivity without borders.

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CINI4.0

cornet

Shopfloor digitalization means:

- **vibration analysis**
- **acoustic analysis**
- **energy (electric, pneumatic and hydraulic) consumption analysis**
- **temperature/humidity/dust/ flash control**

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“Shopfloor digitalisation” for “Condition Monitoring” for “Predictive Maintenance”, about Digital Environement Sensors (Bosch CISS Sensor)

This kind of sensors are not part of the PLC project and not necessary for the function of the machine!

The installation of such kind of sensors is clear motivated from the end user and not from the machine builder.

The integration of such sensors is a condition monitoring porject of the end user!

Machine condition tracking enables predictive and remote maintenance to save costs. With CISS production yields can be optimized via live process monitoring. Due to its motion and environmental sensing abilities the CISS is ideally suited for I4.0 applications.

ONE SOLUTION - INFINITE POSSIBILITIES

Accelero-meter | Temperature sensor | Humidity sensor | Digital light sensor | Gyroscope | Magneto-meter | Pressure sensor | Micro-phone

YOUR POTENTIAL USE CASES

Condition Monitoring

Digital Twin | Machine Doctor | Predictive Maintenance

APPLICATION EXAMPLE: Condition monitoring at an injection molding machine in harsh environment

YOUR BENEFITS WITH CISS

- Suitable for condition monitoring within a wide range of
- Different operation modes: data streamer, data logger,

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“Shopfloor digitalisation” for “Condition Monitoring” for “Predictive Maintenance”, about Digital Environment Sensors

SIEDS Multisensor

Funktion

Der SIEDS Industrie-Sensor ist ein Multisensorgerät, das Sensorik, Datenverarbeitung und Netzwerk-Kommunikation in einem größenoptimierten IP65-Gehäuse vereint. Das Sensormodul erfasst und verarbeitet einer Vielzahl unterschiedlicher Umfeldbedingungen wie zum Beispiel Temperatur, Druck, Feuchtigkeit, Luftqualität, Vibration und Akustik für den industriellen Einsatz und stellt diese über den 100Mbit/s M12 D-kodiert Netzwerkanschluss inkl. Power over Ethernet zur Verfügung.
Der SIEDS-Sensor so individuell für jegliche Art von Condition Monitoring Aufgaben für die vorausschauende Instandhaltung (Predictive Maintenance) einsetzbar.

Technische Daten

SIEDS Multisensor

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