



UPM Paso de los Toros

Mayo, 2024

UPMBIOFORE BEYOND FOSSILS



Nuestras operaciones



UPM FORESTAL ORIENTAL

Plantaciones forestales sostenibles
3 modernos viveros
I+D a largo plazo



UPM FRAY BENTOS

1.3 M de toneladas anuales de celulosa kraft blanqueada de Eucalipto (BEKP)



UPM PASO DE LOS TOROS

2.1 M de toneladas anuales de celulosa kraft blanqueada de Eucalipto (BEKP)



LOGÍSTICA INDUSTRIAL

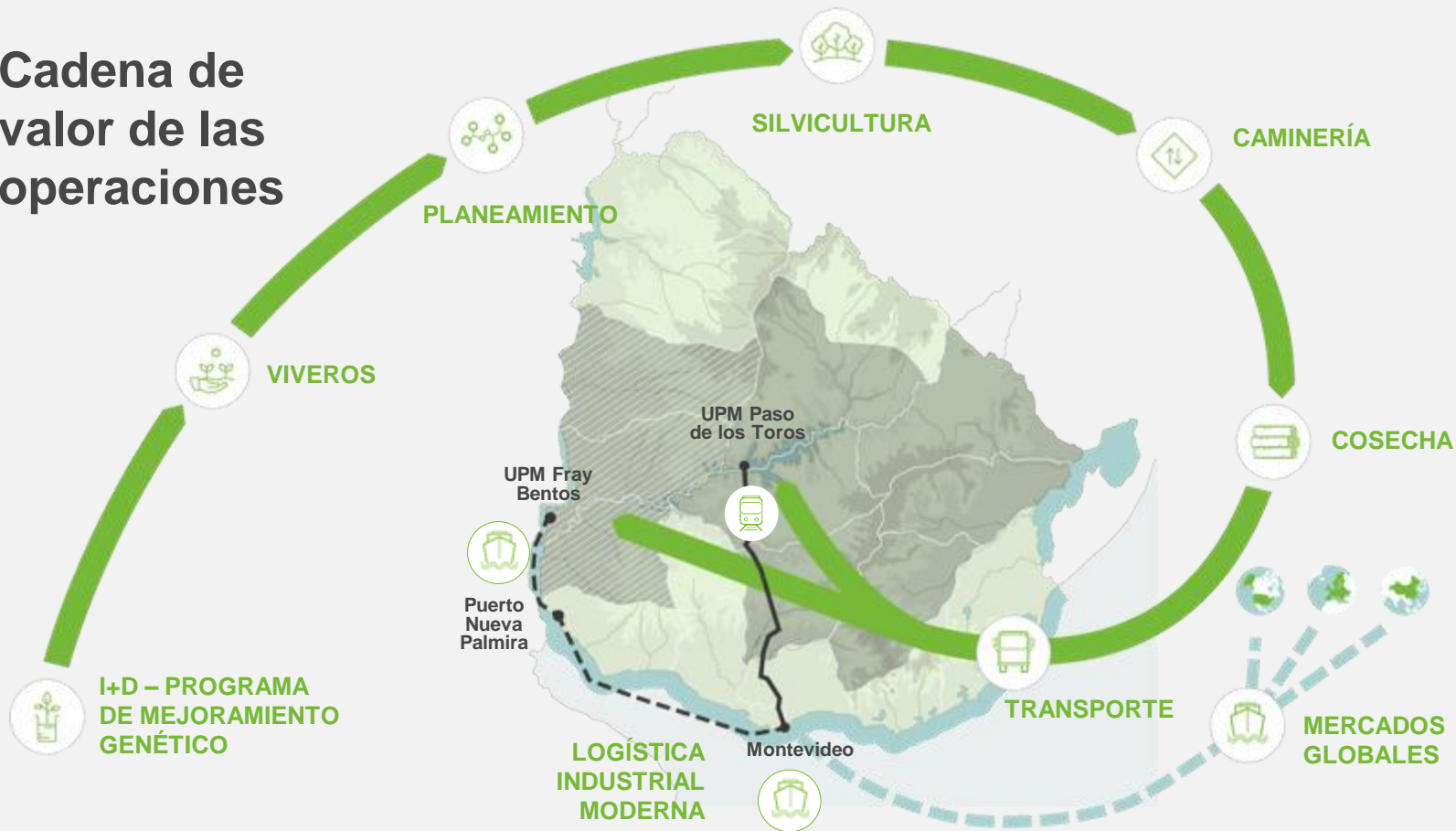
Plataforma multimodal
Terminal portuaria de aguas profundas
Puerta directa a los mercados mundiales



FUNDACIÓN UPM

Contribución al desarrollo de comunidades en el interior del país

Cadena de valor de las operaciones





Impacto positivo de las operaciones



7.000 empleos directos
UPM y contratistas



600 pequeñas y medianas empresas
uruguayas



~3,4% del PIB de Uruguay



USD 1.900 millones
en exportaciones al año



USD 290 millones
en salarios al año



+ 160 MW
de energía renovable
a la red nacional



USD 280 millones
en impuestos y
seguridad social al año

UPM Paso de los Toros – nueva planta de celulosa de clase mundial



**~2,1 millones de
ADt por año BEKP**
capitalizando 15 años de
experiencia en Uruguay



Abril 2023
start-up



**Proyecto de
inversión de 3.47
millones de dólares**
en la planta, terminal
portuaria de aguas
profundas en Montevideo y
desarrollo de infraestructura



1000
Personas ingresan
diariamente



Diseño de planta de última generación



Caldera de recuperación

Recuperación de químicos de proceso (Na/S), producción de vapor y electricidad mediante 2 turbinas de vapor.

Línea de Fibra

Tecnología de blanqueamiento ECF

Secado | Embalaje

2 secadoras de pulpa
6 líneas de empaquetado

Plantas de agua y utilities

Toma de agua, planta de tratamiento de agua y producción de agua potable.
Tratamiento de aguas residuales

Caldera de potencia

Biomasa y sólidos en electricidad.

Patio de Madera

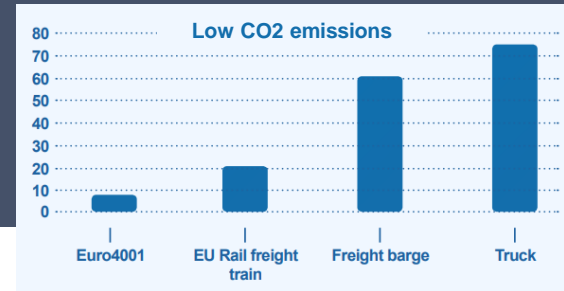
Limpieza de madera y producción de chips.
4 líneas de chipecado y almacenamiento de biomasa



Más seguro y amigable con el medio ambiente



- Los más altos estándares de seguridad y automatización para el transporte ferroviario en las Américas (ETCS nivel 1)
- Consumo de energía 3 veces menor que el transporte por carretera
- Reducción significativa de los niveles de ruido y vibraciones en línea con las normas europeas
- Vagones de celulosa diseñados exclusivamente para esta operación



Logística de celulosa- de Paso de los Toros para el mundo

~270 kilómetros entre Paso de los Toros y Montevideo



Transporte alternativo de pulpa por carretera
~200 viajes diarios



7+7 trenes/día
1 tren cada 2 horas
Acceso directo a la terminal portuaria



De Uruguay al mundo

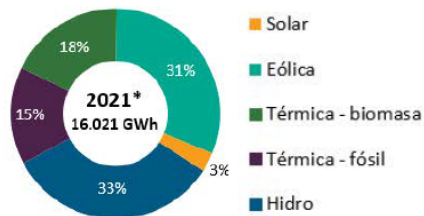


ENERGÍA

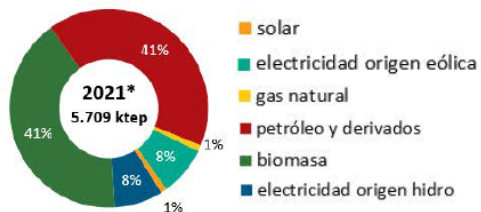
Las políticas estatales de la última década lograron que el suministro de energía eléctrica de Uruguay provenga de fuentes renovables; y durante el mismo período, la demanda de energías renovables creció de manera constante. Actualmente Uruguay genera energía hidroeléctrica, eólica, solar y de biomasa. Esta última proviene principalmente de la industria forestal. El suministro adicional de energía de biomasa predecible contribuirá con la estrategia de crecimiento de energías renovables del país.

MATRIZ DE ENERGÍA ELÉCTRICA ACTUAL EN URUGUAY

Generación de energía por fuente



Abastecimiento de energía por fuente



Obras de interconexión eléctrica del proyecto de UPM Paso de los Toros que une a la planta con la red nacional:



Subestación de UTE adyacente a la futura planta de celulosa



Línea de alta tensión de 11 km conectando con Rincón del Bonete



Ampliación de la subestación en Rincón del Bonete



Inversión de ~20 millones de dólares a cargo de UPM

Impacto de las plantas de UPM en la matriz energética nacional

- Con las dos plantas en funcionamiento, UPM produce un total de unos 400 MW, que utilizará y transferirá la energía excedente en línea con los planes específicos del proyecto y la mayor eficiencia energética de la planta.
- En particular, planta en Paso de los Toros genera un excedente de más de 150 MW de energía firme, predecible y renovable que volcará a la red fortaleciendo la matriz energética del país, equivalente a un 8% de la demanda en Uruguay.
- Contabilizando la generación total de energía, UPM aporta el 20% del total generado en el país, y el total de biomasa 30%.
- La demanda de energía en el país crece un 2,6% por año. La contribución de la nueva planta de celulosa equivale a unos tres años de crecimiento de la demanda. Considerando la energía primaria, la biomasa pasa del 41% a más del 50%.
- Estas mejoras en la infraestructura eléctrica se integran a otras que reforzarán la red existente y la dotarán de mayor robustez a la conectividad y capacidad eléctrica, generando mejores condiciones para la instalación de futuros proyectos energéticos e industriales

Guiding Principles



Regulatory and Standards Compliance

Efficiency

Reliability

Automation and Productivity

By Michael Conville



Regulations & Standards , Safety , Security – compliance with recognized industrial, professional & governmental bodies



- All UPM EIA_ICT Standards issued
- Use of Latest IEC Standards
 - Gen Breaker IEC 62271-37-013
 - Cyber Security IEC 62443
- PED 2014/68/EU
- Machinery directive 2006/42/EC
- Low voltage directive 2006/95/EC
- Power Transformer Efficiency 2009/1
- Electromagnetic compatibility 2004/1
- ATEX directive 2014/34/EU.
- HAZOP, IEC 61882:2016
- ASME



Energy



- 280 MW Generation Capacity / 150 MW Electricity Sales to UTE
- 130 MW Mill running load -> 2/3 VFD

- Water Cooled Medium Voltage drives
- High Efficiency Motors
- Server & DCS rooms no windows & sealed for security, contamination & cooling purposes
- Gravity fed Post ETP cooling towers and outlet
- Control strategy of using Extraction TG (max efficiency) versus Condensing TG

Reliability

- Single high-quality equipment (installed 'standby' by exception)
- Conformal coating on electronic boards
- Gas-Insulated-Switchgear (GIS) for 150 & 33 kV – Consider Service Continuity
- 2200 On-Line Condition Monitoring points – all Motors >400kW with bearing temp
- Smart Generator & transformer on-line condition monitoring instruments
- All UPS with full alarming and remote condition assessment
- Full Emergency Power Network
- Many examples of improved process reliability with Boiler technology (additional Soot blower lanes, improved materials in superheater leading edges & furnace corners, improved air preheater materials etc.)



**SIMPLICITY IS
PREREQUISITE FOR
RELIABILITY.**



Automation & Productivity - Ease of Use – Minimize downtime of operation, Fast response recovery from problems, condition monitoring & analysis



- Plant wide WiFi (or 5G) for operations & Mtce (SAP Mobile, Plant Operations on Mobile)
- Minimize automation model types & have consistent Human Machine Interfaces (protective relays, PLC's, etc)
- Minimize 'Black box' applications & put on DCS as much as possible



Automation & Productivity - Ease of Use – Minimize downtime of operation, Fast response, recovery from problems, condition monitoring & analysis



- Sensor & Data analysis in instruments and electrical equipment (Condition Monitoring 'in-built)
- Intelligent Digital twin for data collection & analysis
- Augmented reality for troubleshooting
- Remote Access Services (RAS)
- - TG RAS example ..#'s Cold Starts, # Coastdowns, # & amplitude of load changes, vibration trending, hours running, pressures operated, temperatures operated .. Outage planning with measurements versus solely 'time based'

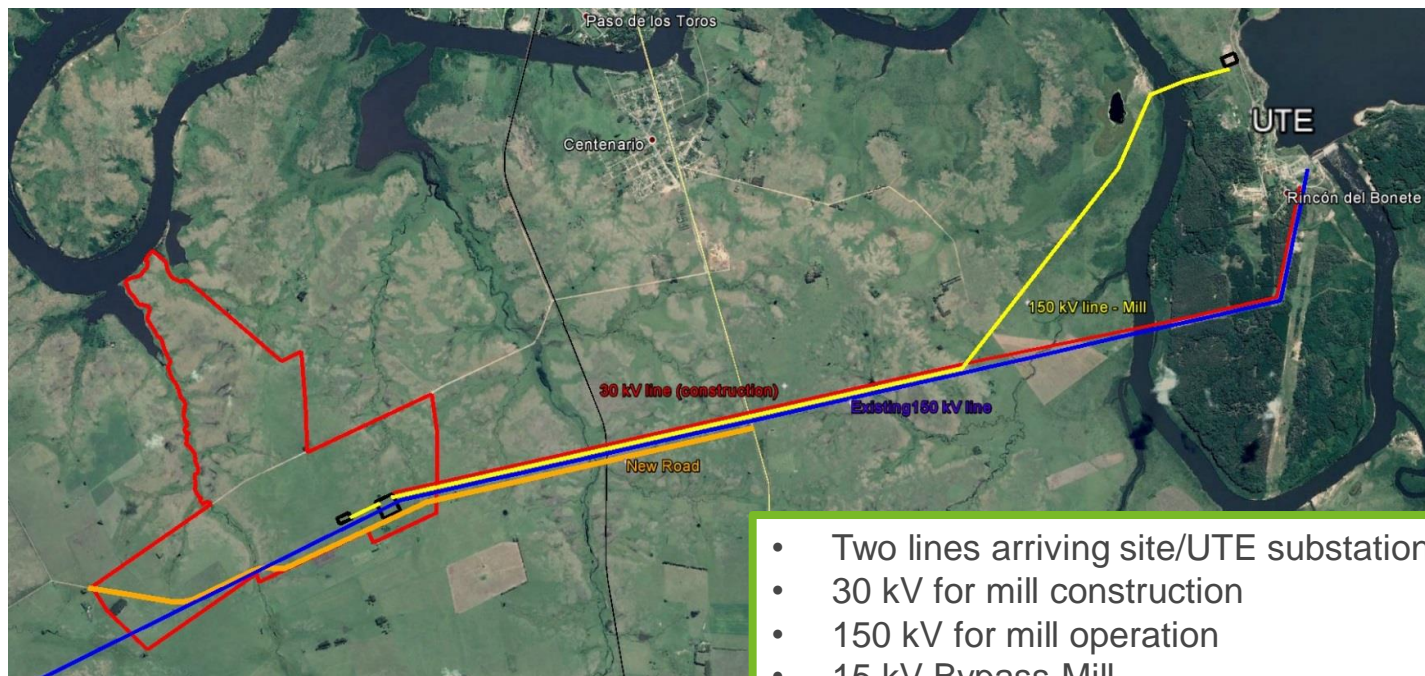




UPM Electrical

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UTE / TAURUS Electrical Transmission Power Line paths



Design principles

- Reliability in design and technology
 - Definition of the equipment. High reliable equipment. Europe origin.
 - Definition of measurements. Temperatures, diagnostics, etc.
 - Design of the installation. (trafo, MV terminals, MCC)
 - HV
 - Higher redundancy level.
 - Turbines connected to HV also making redundancy of the system higher.

Design principles

- MV design and distribution
 - MV switchgear with single GIS tank. Fast recovery from a failure. “easy” to change.
 - Avoid one common failure mode whenever is possible.
 - Trafos “not alone” in the different areas
 - Redundant topology.
- LV
 - Multidrive concept
 - HVAC distribution as redundant as possible in process trafos (no common mode failure)
 - Diesel generator in raw water. Only one feeding underground cable.

HV-MV distribution

- 150 GIS double busbar. High availability level because of the buffer compartments.
- 3 MV 33 kV switchgear. Loop connection between those. Backup from UTE to RB.
 - Recovery Boiler
 - Fiberline
 - Cooling towers
- Radial concept from MV to the areas.
 - 4MVA trafos to the process.
 - LV busbar to the MCC
 - 2MVA for lighting maintenance and Generator backup equipment.
 - LV busbar to the MCC

LV distribution

- IE4 Motors (highest efficiency)
 - Winding temperature measurement for all motors over 110kW
 - Temperature measurement for NU bearings and for motors over 400kW.
- VSD and Simocode (DOL). Profinet ring connection.
- MCC with withdrawable cubicles. Big size motors and VSD fixed.
 - Temperature monitoring in the incomers and the main busbars.
 - Redundant power sources for control voltage with Profinet connection with diagnostic.
- Sectional drive in DM with Siemens control system.
- Multidrive in dry machine (no standalone drives). Quality/time~same cost
- Redundant Multidrive in boiler and Fiberline.

A. Energy Efficient Power Distribution Engineering

- **Power transformers**
 - Even if not mandatory in Uruguay transformer losses have been specified in according to strict EU EcoDesign regulations.
 - Transformer losses comply with the EcoDesign Tier 2 efficiency standards of the European Union. Lower, Tier 1 efficiency requirement was valid at time of procurement. High purity steel has been used to achieve required efficiency.
 - Power transformers are installed in transformer rooms designed for natural cooling – no need for cooling fans.
- **Distribution transformers (4 MVA process, 2 MVA building electrification)**
 - LV distribution transformer losses comply with the EcoDesign Tier 1 efficiency standards of the European Union
 - Distribution transformers are installed in transformer rooms designed for natural cooling– no need for cooling fans.
- **Harmonic filtering and power factor correction**
 - Harmonic currents are filtered and power factor correction is optimized against investment costs and load losses

B. Energy Efficient Process Electrification Engineering



B. PROCESS ELECTRIFICATION

- Frequency converters – also liquid cooled drives
 - According to a frequency converter manufacturer variable speed drive controlled pump and fan applications normally save energy 10–30%.
 - About 60% of the Taurus project motor power is controlled with frequency converters, which is larger amount than in earlier projects (about 50 %).
 - For effective heat transfer of drives > 2000 kW, liquid cooled drives are installed for recovery boiler feed water pumps (4x 2900 kW) and ID fans (5x2200 kW)
- Motor efficiency,
 - Even if not mandatory in Uruguay motor efficiencies have been specified in according (and even exceeded) to strict EU EcoDesign regulations.
 - It has been specified, that all motors shall be at least efficiency class IE3 (Premium efficiency), which is current EU requirement. Requirement is valid also for frequency-controlled motors.
 - Higher efficiency class IE4 (Super-Premium efficiency), which comes mandatory in EU 1st July 2023, has been specified for the standard motor ratings which area available and economically reasonable.
 - Total motor installed power is more than 300 MW
 - 690/400 V: 65% of motors is IE3
 - 690/400 V: 35% of motors is IE4
 - 3.3 kV : 50% efficiency correspond to IE3
 - 3.3.kV : 50% efficiency correspond to IE4

C. Energy Efficient Building Electrification Engineering

- Led lighting

Lighting has been designed with LED lighting fixtures, which saves energy about 60 %

compared to conventional metal halide and high-pressure sodium fixtures used in Fray Bentos.

- Lighting controls in NPB with DALI



Automation

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ICS overview

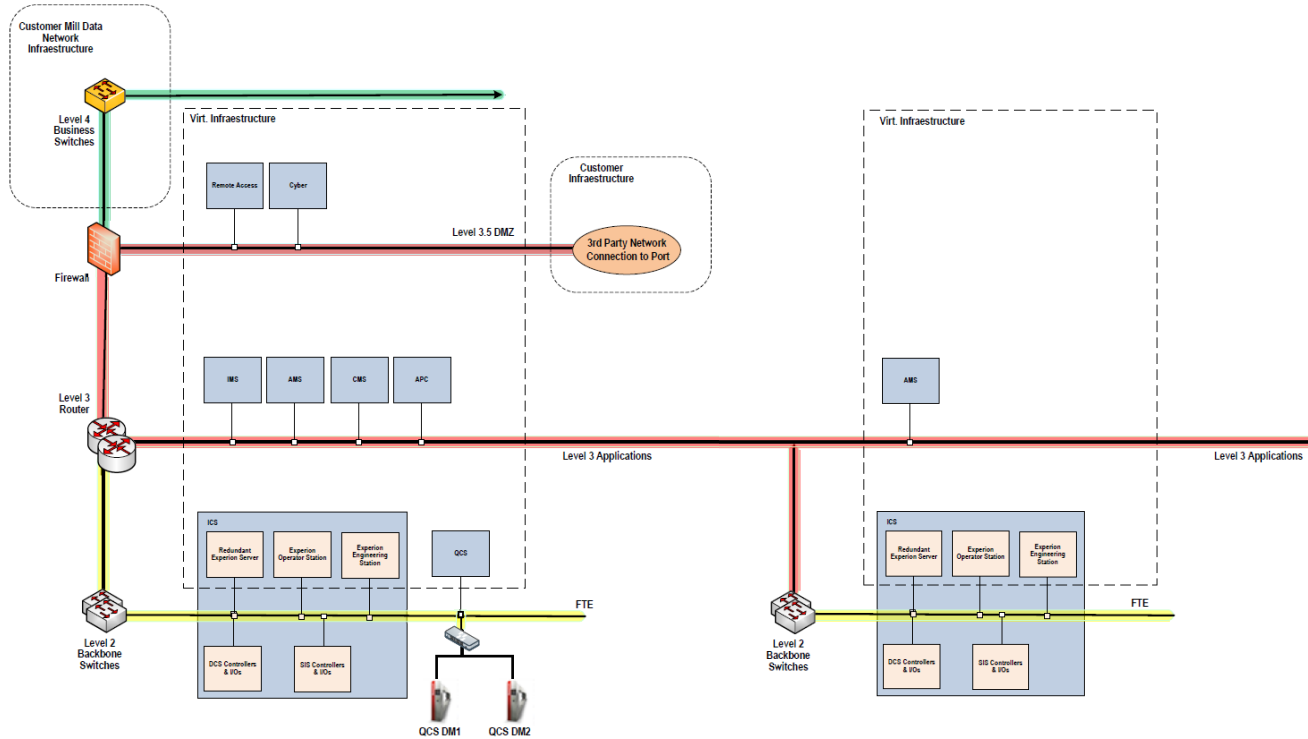


DCS Architecture

- Honeywell Experion R5XX
- ~ 45 C300 Process Controllers
- ~ 448 Universal IO Modules x 32 channels
 - Each channel could be configured as AI, AO, DI, DO
 - Great flexibility !
- ~ 85 Profinet communication segments with VFD/DOL, etc.
 - Ring topology with redundancy



ICS Architecture - Network and Server Layout

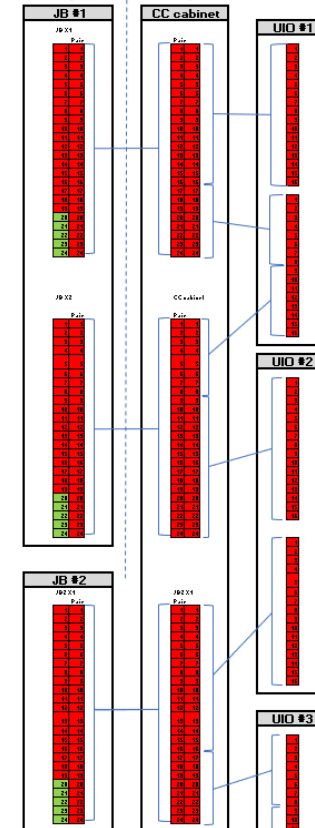


ICS Architecture - Network and Server Layout

- Virtualized environment using High Availability DELL FX2 as physical servers containing VMs with:
 - Experion Servers - DCS stations
 - Information Systems - Advanced control
- 2 locations for physical servers in Main Office and Drying Machines Automation Room
 - Redundancy of VMs inside the cluster
 - If a physical server fails inside the cluster, the VMs are automatically recovered in another server of the same cluster

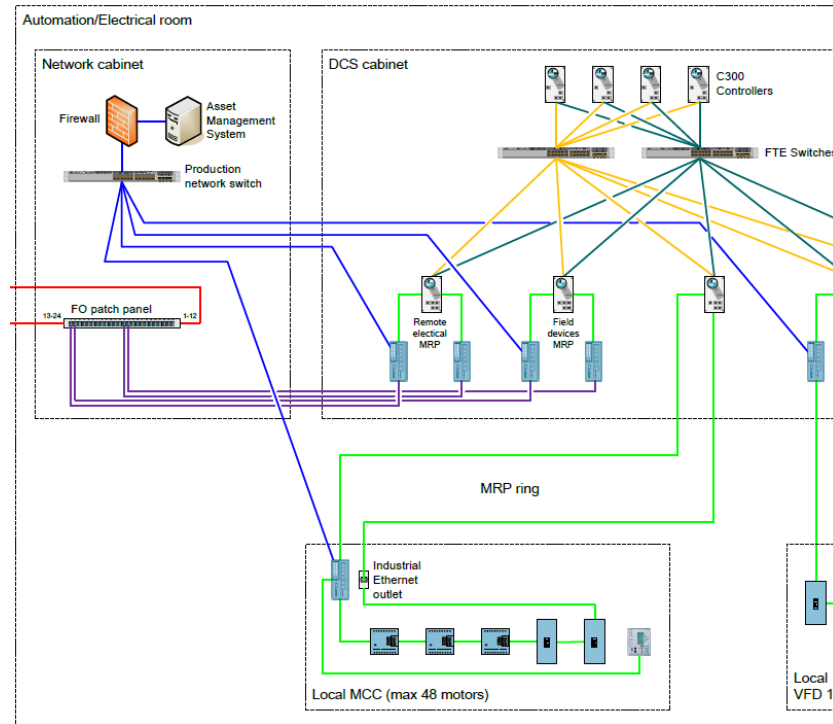
ICS Architecture – IO Structure/Marshalling

- Universal IO modules makes the cross connection not needed
- System side of 24 x 3 layer TB in marshalling cabinet will be fully cabled to UIOM
- Field side of that TB will receive 24 pair cables from JB. Only selection needed is active/passive using/or not last layer of 3L TB
- Spare channels distributed. Available at JB in each TB for easy access.



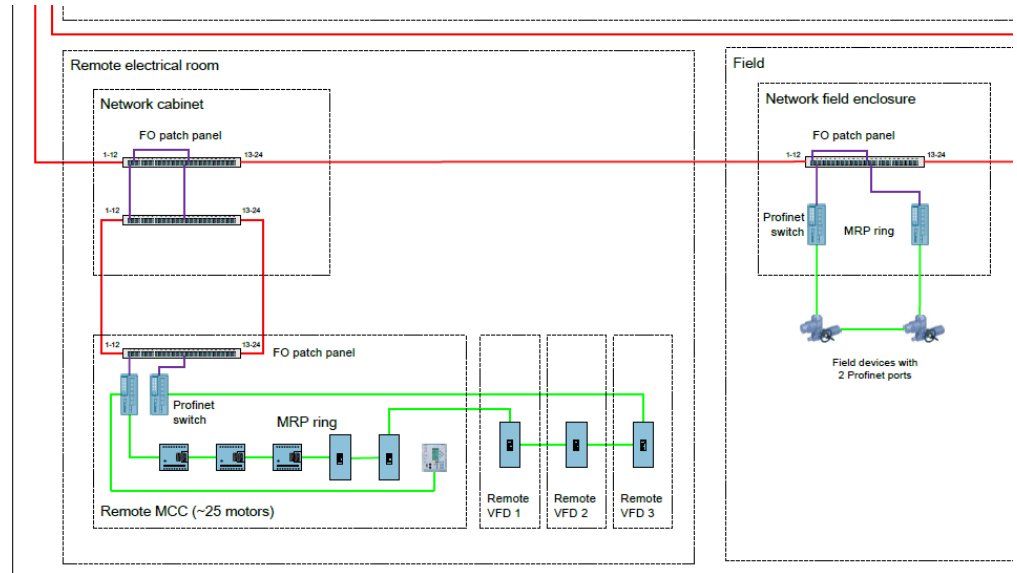
ICS Architecture – Profinet

- Profinet MRP ring with EIM (master) and up to 50 slave devices
- Each ring could be cut in one place and still work.
- Commissioning and Engineering tools available from centralized computer.



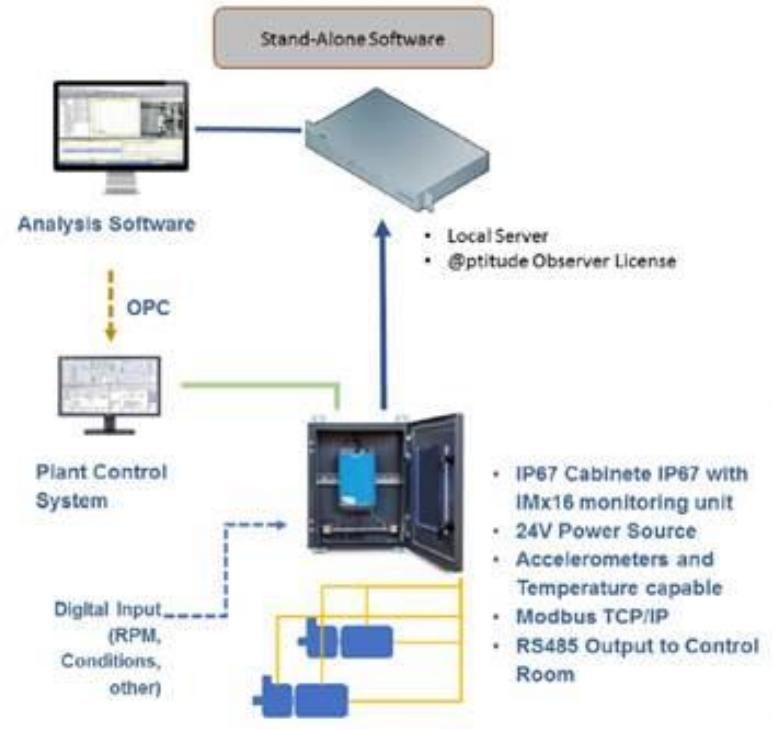
ICS Architecture – Profinet

- Field cabinets are connected through Fiber Optic
- Then a ring with copper is made locally around the cabinet. 100mts max distance between each hop



CMS Architecture - Honeywell supply

- 1366x accelerometer measurements
- 166x IMx for online data collection (located in field Junction boxes)
- 3x Microlog GX75 for offline data collection
- SKF @ptitude system for collection and analysis
- OPC connection with DCS/PHD to sync process data with vibration analysis



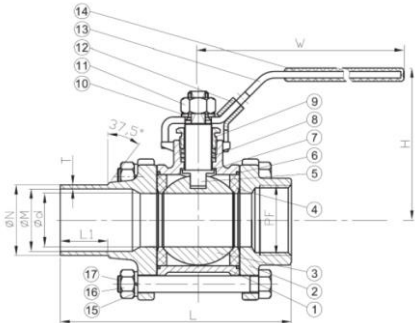


INSTRUMENTATON

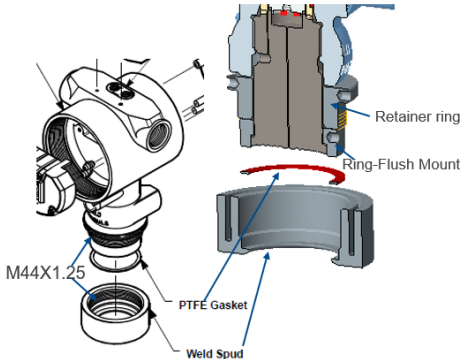
Developing "C" Connection With G 1" thread

Pressure measurements

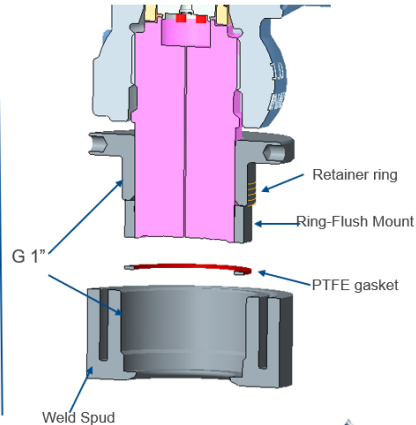
- Process connections in use:
 - NPT 1/2"
 - DN80 FLANGE
 - M44
 - G 10option G1" isolation valve



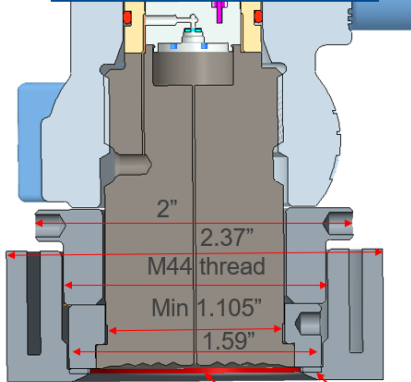
Current "C"- 1 1/2-in. Threaded, 316L SST Weld Spud with Stress Isolation and PTFE Gasket



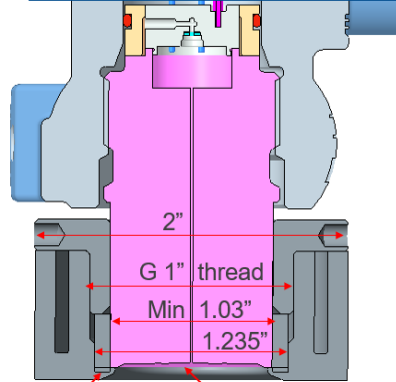
New Design - G 1". Threaded, 316L SST Weld Spud with Stress Isolation and PTFE Gasket



Current "C" 1.5" connection



New design - G 1" thread connection



1" diaphragm PTFE gasket 0.7" diaphragm

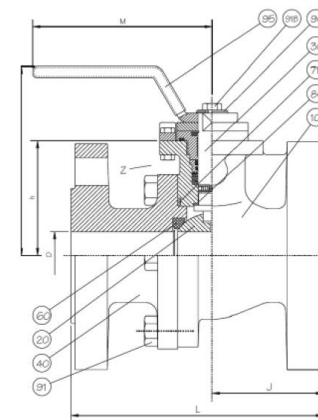
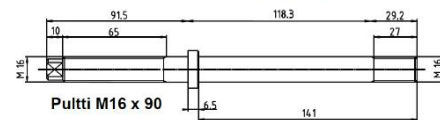
Isolation valves

- 2 options DN80
 1. With flushing flange
 - 07EF-1507, valve (L = 122 mm), PN10/16
 2. Without flushing flange
 - 01BA-14F, valve (L = 180 mm), PN40

Tilauskoodi PAEF1080



Tilauskoodi PAAV2080



Automatic valves design principle

- Automatic valves shall be equipped with 4-20mA HART-compatible with diagnostic management (EDL/DDDL) positioners.
- Control Valves actual position is taken in to the DCS via Hart.
 - HART data will be used **only for information** and display (not for control actions)
- On-Off Valves will have smart positioners **with position transmitter (4-20mA)**.
 - Limits are calculated from that signal (Close < 5%, Open >95%).
- **SIS** On-Off Valves
 - Safety solenoid installed on the valve (1 Pc for SIL1 and 2 pc for SIL2) and safety position will be achieved by spring
 - SIL open / close limits switches connected to SIS.

DP flowmeters

- Steam flowmeters standard selection in Venturi tubes
- Small flowmeters will be Vortex \leq DN300

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