PERTAMINA GAS

PERTAGAS INTEGRATED PIPELINE AND ENERGY SUMMIT

Providing The Appropriate Pump For Fluid and Multiphase Applications

Steven Ho | Jakarta | 17 June 2025

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INTRODUCTION TO LEISTRITZ

Introduction to Leistritz

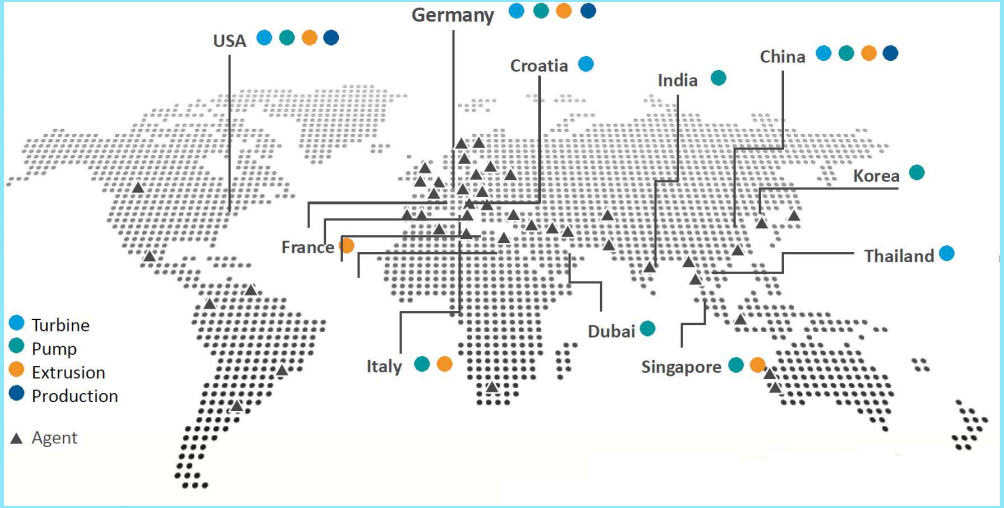
Brief Introduction / History / Organization Structure

- Founded in 1905. Screw pump business started in 1924.
- Privately owned, independent company
- Certification in accordance with DIN EN ISO 9001:2008, DIN EN ISO 14001:2004, DIN EN ISO 50001:2011, BS OHSAS 18001:2007, GOSGOR TECHNAZOR, RS Supervisor, **ABS, BV, GL, RINA und RMRS**

LEISTRITZ AG

Shared Service Center: Finances, Human Resources, Strategic Procurement, Facility Management, Corporate communications, Trainee program

TURBINE TECHNOLOGY	*PUMP TECHNOLOGY*	*EXTRUSION TECHNOLOGY*	*PRODUCTION TECHNOLOGY*
Components for aircraft engines (e.g. blades, discs, BLISK)	Screw pumps and systems	Extruders and extrusion lines	Machine tools and tools
Facilities: ↗ Nuernberg ↗ Remscheid ↗ Chonburi, Thailand ↗ Belisce, Croatia	Facilities: ↗ Nuernberg	Facilities: ↗ Nuernberg	Facilities: ↗ Pleystein
Subsidiaries ↗ Allendale, NJ, USA ↗ Taicang, China	Subsidiaries: ↗ Milano, Italy ↗ Allendale, NJ, USA ↗ Taicang, China ↗ Singapore ↗ Dubai, UAE ↗ Chennai, India	Subsidiaries: ↗ Ceyzériat, France ↗ Castellanza, Italy ↗ Somerville, NJ, USA ↗ Taicang, China ↗ Singapore	Subsidiaries: ↗ Allendale, NJ, USA ↗ Taicang, China



pipes
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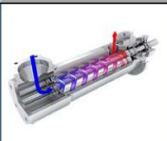
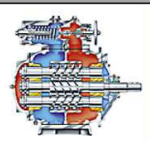
Introduction to Leistritz

Advantages of LEISTRITZ Screw Pumps and what we stand for

Ex | TA Luft | API compliant

- World's **largest range of screw pumps**.
  - We are able to offer a sufficient solution **for nearly every challenge** in a **safe, highly efficient and reliable** way.
  - Our pumps can handle a **wide viscosity range (0,5 – 1 Mio. cSt)**, and we consider the risk of **toxic, flammable or chemical aggressive** medium. We are able to select between **standard materials** or **high-alloy steels**.
  - Also **high pressure application** could be fulfilled.
- One chosen screw pump can handle a variety of fluids with different viscosity or temperature ranges, which means a **very high flexibility** in process.
- LEISTRITZ pumps creates **low shear forces and turbulences** in the fluid, which leads to a very **gentle product delivery**. This also means a **low pulsation** and **quiet operation** mode.

Series:	L2	L3	L4	L5	LPS
					
Used for the transportation of:	light abrasive and corrosive, high or low viscous fluids with poor or good lubricity	non abrasive or light abrasive and corrosive, high or low viscous fluids with poor or good lubricity	abrasive/non abrasive, corrosive/non corrosive, lubricating/non lubricating, high or low viscous fluids	light abrasive and corrosive, high or low viscous fluids with poor or good lubricity	abrasive / non abrasive, corrosive / non corosive, lutricating, low or high viscous singlephase liquids or multiphase fluids with up to 100 % gas content (GVF)
Capacity max.:	900 m³/h 3,960 GPM	700 m³/h 3,100 GPM	5,000 m³/h 22,000 GPM	1,700 m³/h 7,500 GPM	4,500 m³/h 19,800 GPM
Differential pressure max.:	16 bar 232 psi	280 bar 4,060 psi	150 bar 2,175 psi	10 bar 145 psi	150 bar 2,175 psi
Viscosity:	100,000 cst	15,000 cst	150,000 cst	100,000 cst	100,000 cst
Pumping temperature max.:	280 °C 536 °F	280 °C 536 °F	350 °C 662 °F	280 °C 536 °F	350 °C 662 °F

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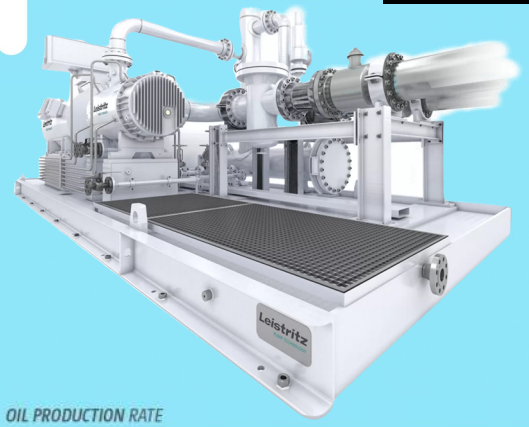
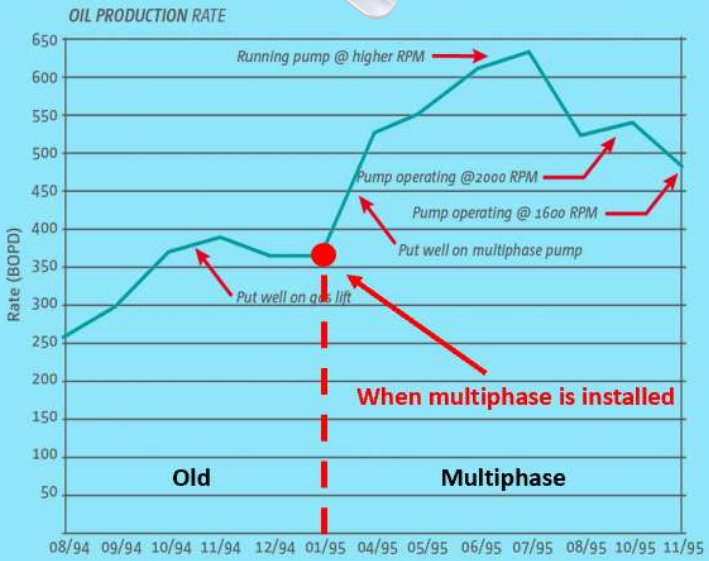
MULTIPHASE APPLICATIONS

Leistritz Pump Technology

Multiphase Technology & Advantages





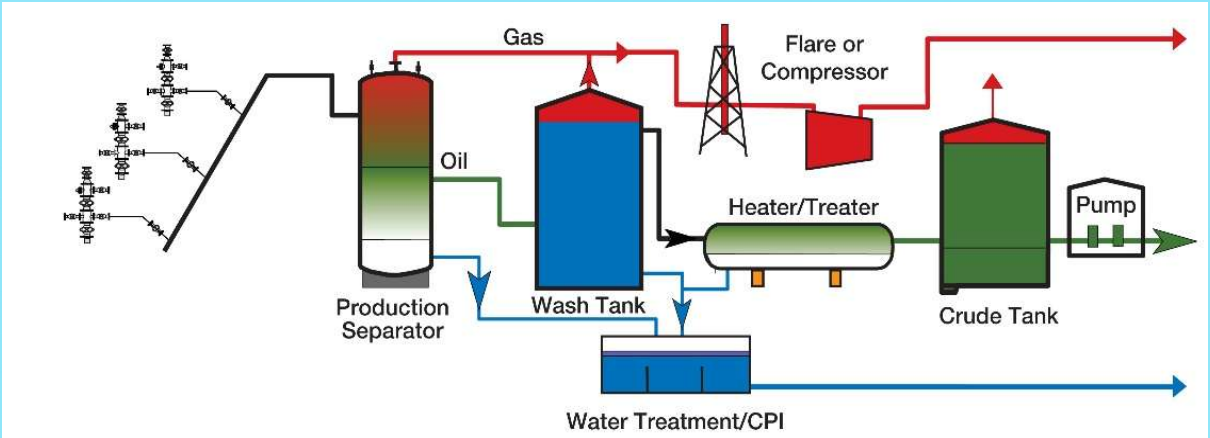
- **What is Multiphase Pump Technology?**
  - Management of liquid in **different phases (e.g. solid, liquid and gas)** through a pump system, with the ability to **transport the liquid** while providing **recovery for the gases**
  - Handles untreated well flow **within one machine**
  - **Gas Volume Fractions (GVF)** from 0 to 100% can be handled
  - **Reduce Greenhouse Gas Emissions** into the atmosphere
  - **No additional seperators** required
  - **No risk of plugging** due to Paraffin / Wax with **screw pump technology**

- **Sustainable Advantages**
  - Prolong production of well with **decreased back pressure**
  - **Pressure boosting** of the well flow to **overcome flow line pressures** – slugs and wax in pipeline
  - **Sustain operation** in **old wells**, **increasing production** – otherwise, shut down/abandon
  - **Adaptable** through time – when well pressure drops with ability to handle slug flows
  - **Lesser power comsumption – More economical**
  - **Increase Recovery of Gases** – Flaring can be **eliminated**
  - **Dedicated Liquid Management System** (LMS)

Leistritz Pump Technology

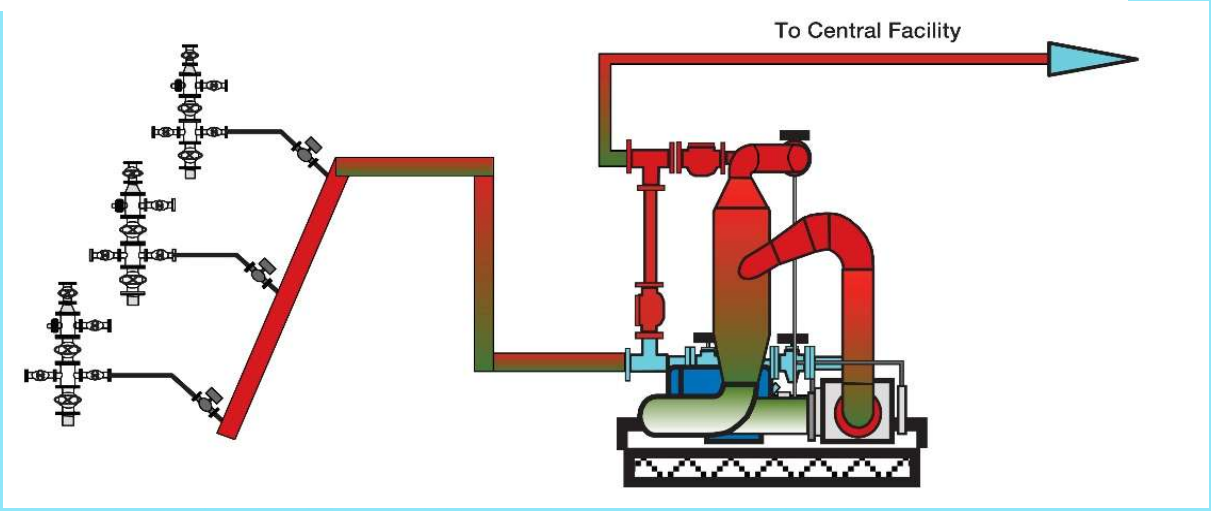
Multiphase Technology & Advantages

CONVENTIONAL PRODUCTION SYSTEMS



- **Sustainable advantages**
  - **Reduce capital investment** and **power consumption** vs conventional system
  - **Lowers overall maintenance costs**, lesser equipment

MULTIPHASE PRODUCTION SYSTEMS



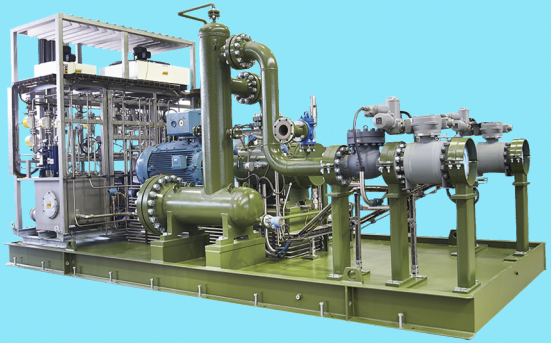
Flaring is eliminated

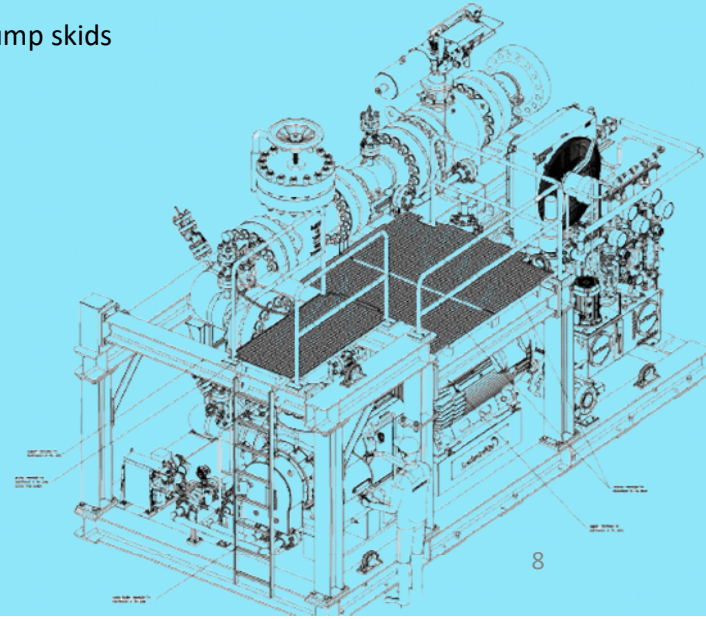
- **Less pollution** to the environment
- Other uses for recovered gas e.g. power generation, heating, etc.

Leistritz Pump Technology

Multiphase Pump Skids

- **Scope of supply**
  - Multiphase Pump
  - Motor / Engine (Electric, Diesel or Gas)
  - Baseplate / Coupling & Guard
  - Lube & Seal Oil System
  - Instrumentation, Junction boxes, etc.
  - On-skid Tubing & Wiring
  - Liquid Management System – **dedicated system** for **every pump, ease of maintenance and shutdown**
  - On-skid Piping with Filter, Shut-off valves, etc.
  - Variable Speed Drive
  - PLC incl. Touch Panel, MV Switchgear, UPS, Remote Control (SCADA Interface), etc.
  - Container for Control Equipment and Pump skids

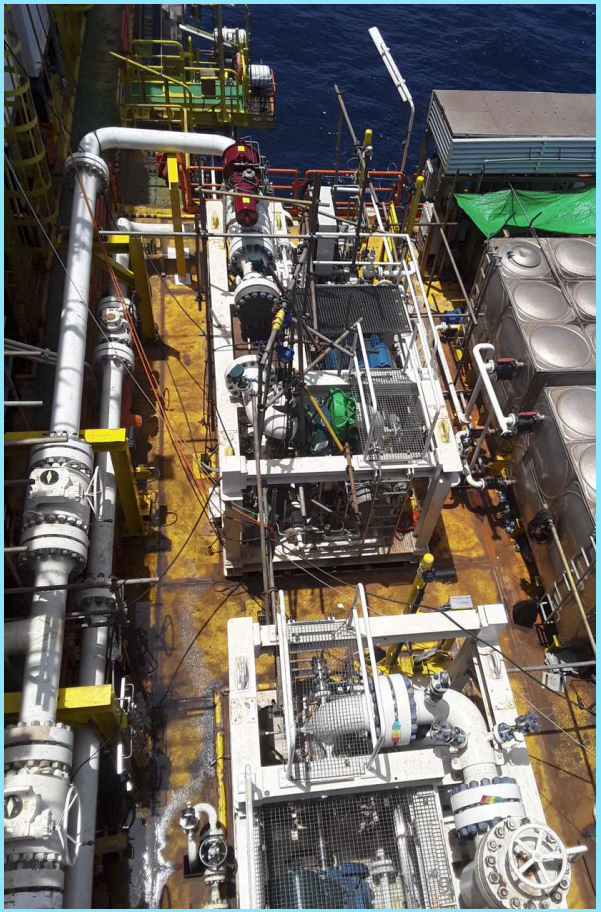




Leistritz Pump Technology

MPP Technology Offshore Reference

- **PTTEP KIKEH DTU Project – Malaysia**
  - Pumps: 2 x L4NG-220
  - Capacity: up to 680m³/h
  - GVF: up to 65%
  - DP: up to 16 bar
  - Power: 500kW
  - Speed: up to 3200 rpm
  - Installed 2023
  - Commissioned 2024



Leistritz Pump Technology

PERTAGAS Project Reference 1

- **Pengadaan Booster Pump Project – Batang HO, Indonesia**
  - Pumps: 4 x L4MG-240
  - Capacity: up to 200 m³/h
  - DP: up to 32 bar
  - Power: 400 kW
  - Speed: up to 1450 rpm
  - Installed and commissioned 2024

- **Pengadaan Booster Pump Project – Kota Batak Junction, Indonesia**
  - Pumps: 5 x L4MG-240
  - Capacity: up to 200 m³/h
  - DP: up to 19 bar
  - Power: 400 kW
  - Speed: up to 1450 rpm
  - Installed and commissioned 2024

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Leistritz Pump Technology

PERTAGAS Project Reference 2

- **Feed Upgrading Booster System – Manggala, Indonesia**
  - Pumps: 3 x L3MG-090
  - Capacity: up to 660 L/min
  - DP: up to 40 bar
  - Power: 110 kW
  - Speed: up to 1450 rpm
  - Target delivery in July 2025

- **Feed Upgrading Booster System – Kota Batak, Indonesia**
  - Pumps: 4 x L3MG-100
  - Capacity: up to 1100 L/min
  - DP: up to 40 bar
  - Power: 132 kW
  - Speed: up to 1450 rpm
  - Target delivery in July 2025

Oil and Gas – Upstream

Other References

Fuel Oil transfer pump L4MG-220
1,530 m³/h @ 12 bar

Pipeline pump L4MG-410
3,948 m³/h @ 20 bar

Crude oil booster pump L3HG-xxx
50 m³/h @ 103 bar

Multiphase Pump L4MG-200
388 m³/h @24 bar

Multiphase Pump L4MG-200
517 m³/h @17.5 bar

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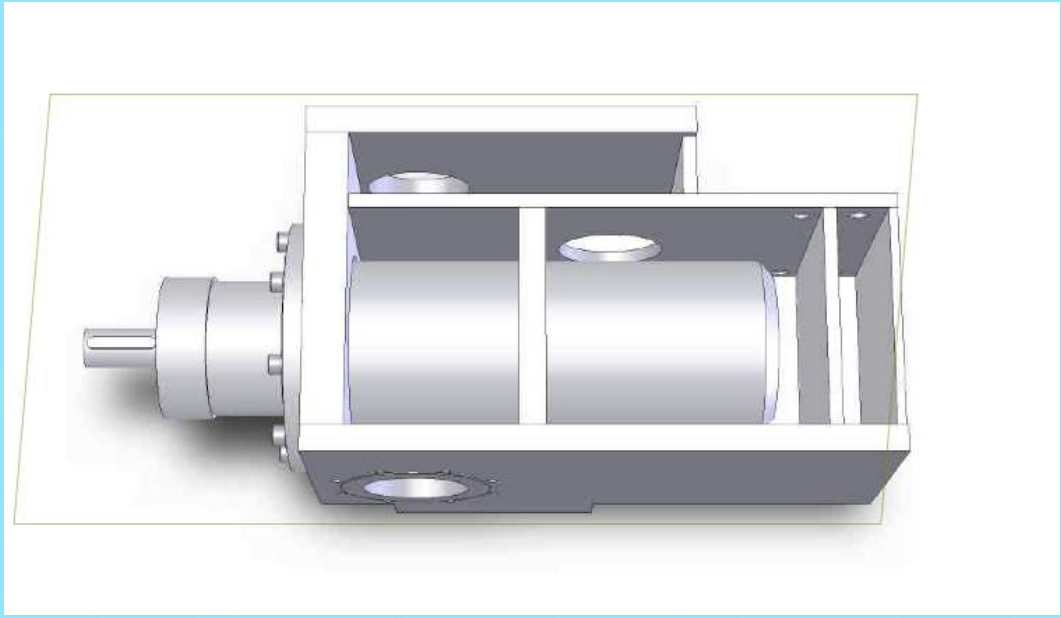
RE-ENGINEERED PUMPS

Re-Engineered Pumps

What is Re-Engineered Pumps?

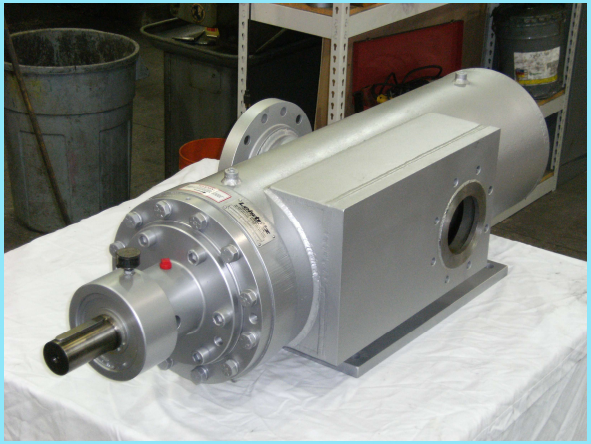
- Newly built customized pumps designed according to the operational duties of existing installation (independent of screw pump vendor)
- A customized casing is used closely fit into the envelope of the existing installation



Easy and fast exchange without the need of piping modifications!

Re-Engineered Pumps

References



End User: Murphy Oil
Existing Pump: IMO C324-375
New Pump: L3MC-125

End User: Husky
Existing Pump: IMO 8L-400
New Pump: L3HC-100

End User: ConocoPhillips
Existing Pump: Gearex E-3
New Pump: L3MC-125

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Objective: Sharing practical insights in project management & technical execution

Project & Product Management Method

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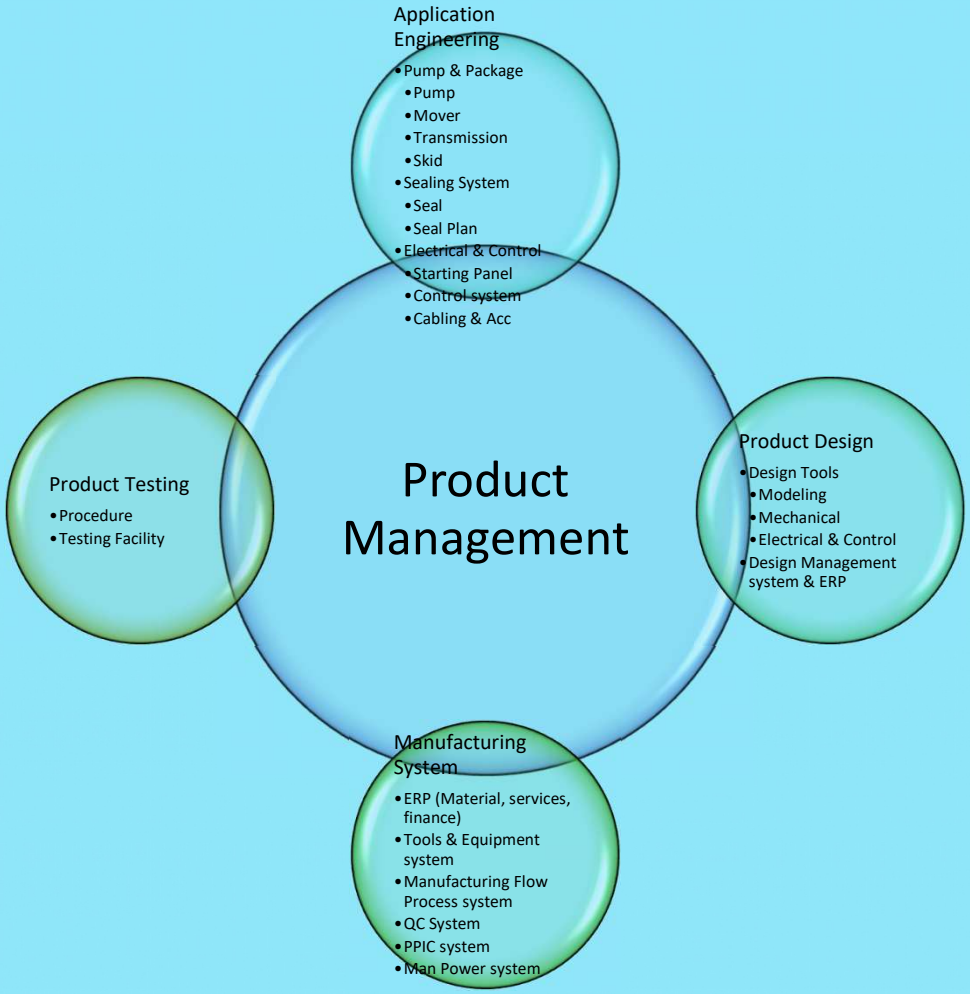

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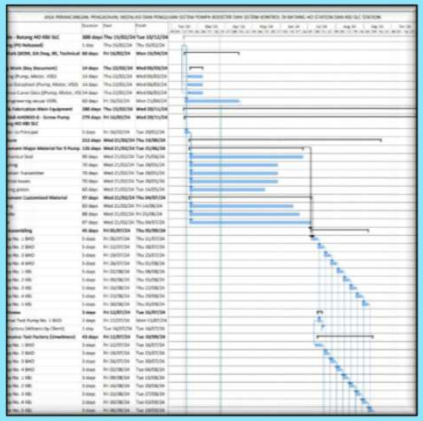
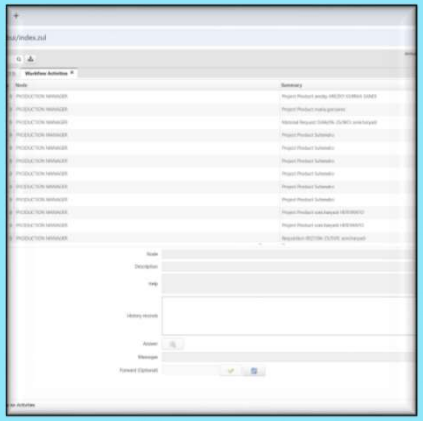
Project Management System

Schedule Management



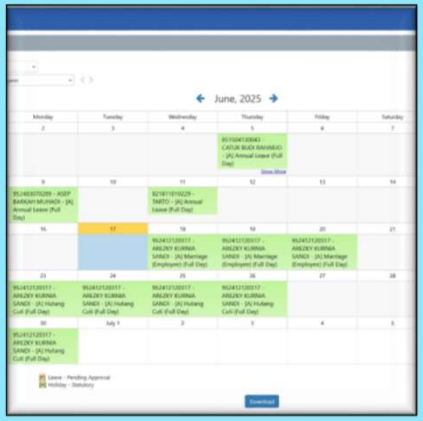
ERP System



Internal Job System

Engineering & QC Document system

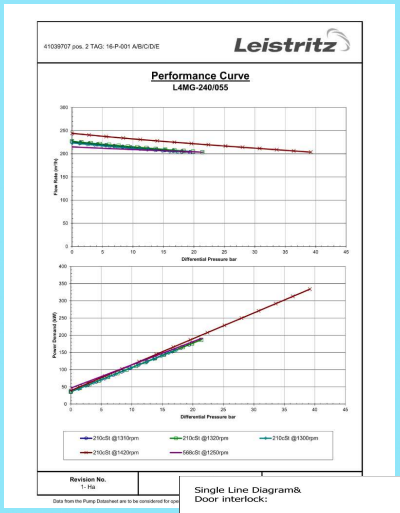
Man Power system

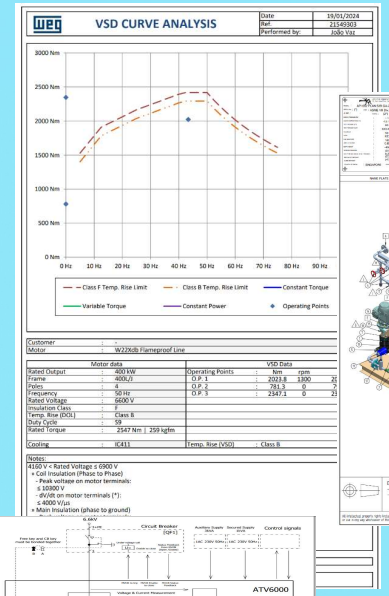


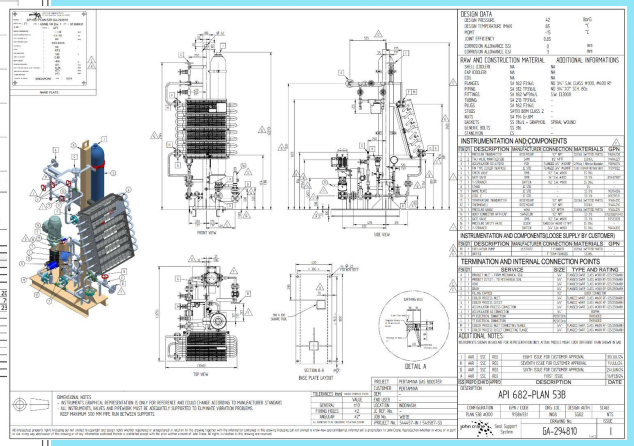
Communication – Office 365

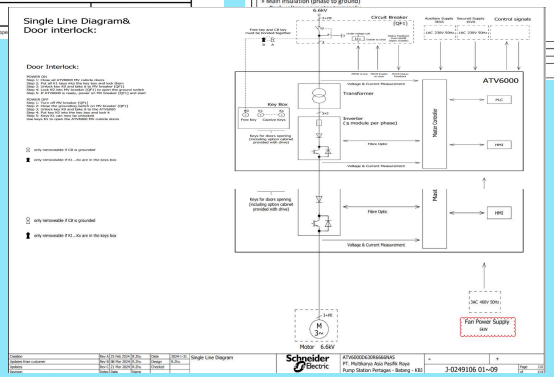
Product Management System

Product Application









- Leistritz Application tools
- WEG Application tools
- Schneider Application tools
- Jhon Crane Application tools

Product Management System

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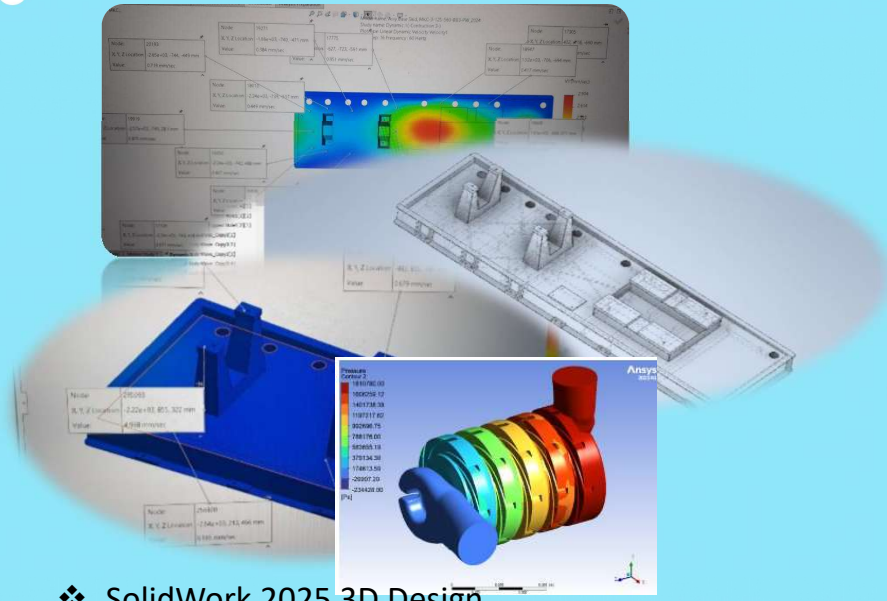
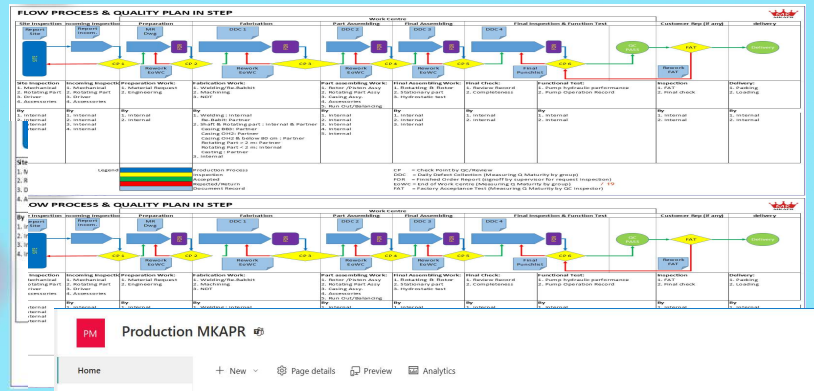
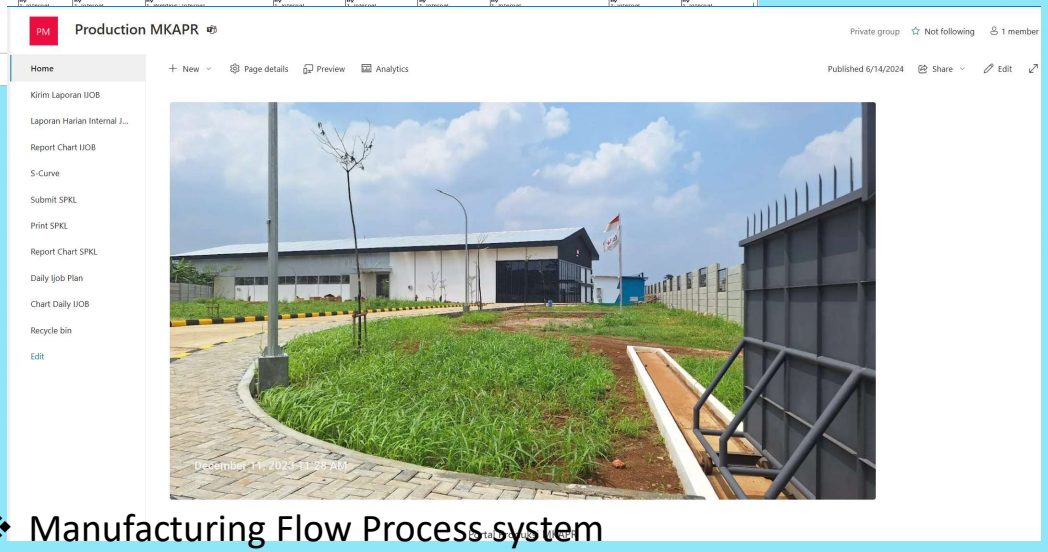
Product Design



- SolidWork 2025 3D Design
- SolidWork 2025 static structure analysis
- SolidWork 2025 dynamic simulation for structure vibration analysis
- ZW CAD Manufacture 2025
- Pipe Flow Expert
- ANSYS hydraulic pump design

Product Manufacturing





- Manufacturing Flow Process system
- Production Management tools portal

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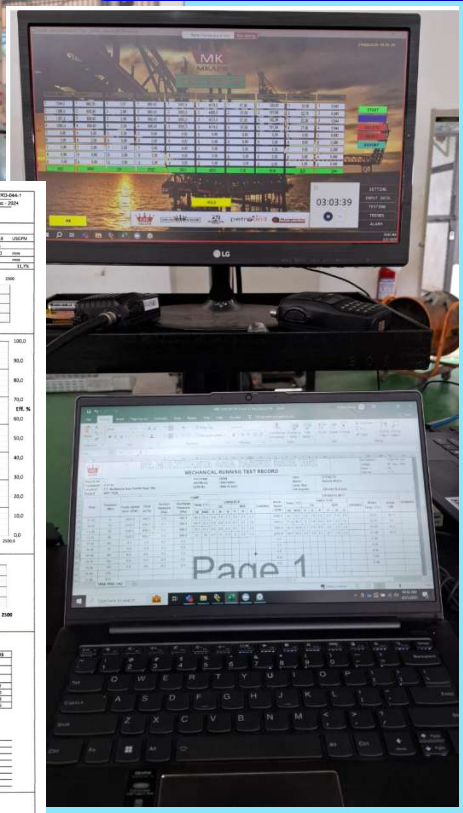
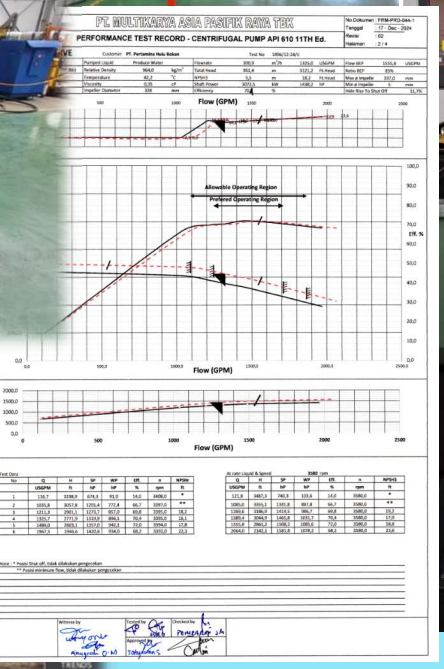
Product Management System

Product Testing

MV VSD, 2750 kVA, input voltage 6.6 kV, output voltage 3.3 ~ 6.6 kV, 50/60 Hz





- Hydraulic Performance
- Mechanical Running Test
- Vibration spectra
- NPSHr Test
- FAT Report

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Pengadaan Booster Pump Package Batang HO & KBJ Junction SLC

Project Details

Project Name : Project Pengadaan Booster Pump Package Batang HO & KBJ Junction SLC (2024 – 2025)

EPCI : Consortium PT Elnusa Tbk – PT Pgas Solution

Bowheer : PT Pertamina Gas

Quantity : 9 Units (5 Units KBJ SLC & 4 Units Batang HO)

Scope : Engineering, Procurement of Main Unit (Pump Package), Supervision, Installation & Commissioning, Mechanical & Performance Guarantee

Challenges : Short Delivery Time (10 Months on Site), Solid Particles (Up to 3mm), High Viscosity, and National Strategic Project

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Pengadaan Booster Pump Package Batang HO & KBJ Junction SLC

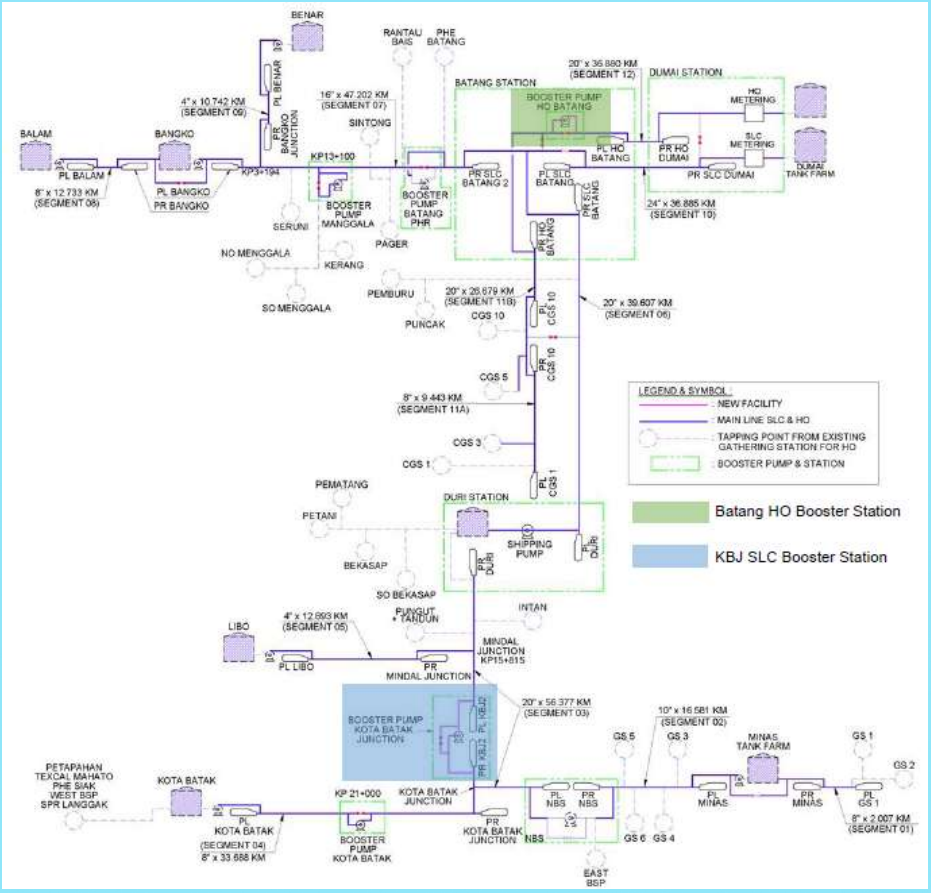
Project Application

Batang HO Area

PT Pertamina Gas plans to send the Heavy Oil (HO) crude from several Central Gathering Stations (CGS) belonging to Pertamina Hulu Rokan (PHR), up to a flowrate of 89,000 BOPD to be transferred to Dumai Tank

Kota Batak Junction Area

PT Pertamina Gas plans to optimize transmission Sumatran Light Crude (SLC) from several Gathering Stations (GS) belonging to Pertamina Hulu Rokan (PHR), up to a flowrate ±108,325 of BOPD to be transferred to Duri Tank



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Pengadaan Booster Pump Package Batang HO & KBJ Junction SLC

Technical Data

Batang HO Area

OPERATING CONDITION

	MIN	NORMAL	RATED	MAX (1)
CAPACITY: (usgpm)	440	876	876	876
OTHER OPER CONDITIONS: (usgpm)	-	-	-	-
DISCHARGE PRESSURE: (psig)	568.51	534.07	534.07	599.95
SUCTION PRESSURE: (psig)	28.18	252.68	32.68	2.68
DIFFERENTIAL PRESSURE: (psi)	540.33	281.39	501.39	597.27

- NPSH AVAILABLE 25.21 (ft)
- NPIP AVAILABLE (psia)
- NPSHaA / NPIP DATUM: ● C.L. SUCTION NOZZLE ○ TOP PF FOUNDATION
- DUTY CYCLE ● CONTINUOUS ○ INTERMITTENT

(1) Maximum - mechanical design

PUMPED FLUID

- TYPE OR NAME OF PUMPED FLUID: CRUDE HEAVY OIL

	MIN	NORMAL	RATED
TEMPERATURE: (°F)	-	-	100.4
VAPOR PRESS: (psia)	14.7	-	14.7
RELATIVE DENSITY (SG):	0.918	-	0.918
VISCOSITY: (cP)	559	-	2300 (note 15)

- SPECIFIC HEAT Cp (BTU/lb °F)
- CORROSIVE/EROSIVE AGENTS DESCRIPTION
  - ● EROSIVE Sand ○ CORROSIVE
- CHLORIDE CONCENTRATION (ppm) N/A
- H2S CONCENTRATION (ppm)
- FLUID ○ HAZARDOUS ○ FLAMMABLE ○ OTHER
- ○ GAS ○ ENTRAINED ○ SLUG FLOW % BY VOLUME or GVF
- ● SOLIDS PARTICLE SIZE DISTRIBUTION & MIN/MAX 3000 (note 13) (μ)
- ○ SHAPE ○ CONCENTRATION ○ HARDNESS

Kota Batak Junction Area

OPERATING CONDITION

	MIN	NORMAL	RATED	MAX (1)
CAPACITY: (usgpm)	876	876	876	876
OTHER OPER CONDITIONS: (usgpm)	-	-	-	-
DISCHARGE PRESSURE: (psig)	319	319	319	607,6
SUCTION PRESSURE: (psig)	8,59	68,59	38,59	38,59
DIFFERENTIAL PRESSURE: (psi)	280,41	250,41	280,41	599,01

- NPSH AVAILABLE 27,14 (ft)
- NPIP AVAILABLE (psia)
- NPSHa / NPIP DATUM: ● C.L. SUCTION NOZZLE ○ TOP PF FOUNDATION
- DUTY CYCLE ● CONTINUOUS ○ INTERMITTENT

(1) Maximum - mechanical design

PUMPED FLUID

- TYPE OR NAME OF PUMPED FLUID: SUMATRA LIGHT CRUDE

	MIN	NORMAL	RATED
TEMPERATURE: (°F)	-	-	94,82
VAPOR PRESS: (psia)	14,7	-	14,7
RELATIVE DENSITY (SG):	0,85	-	0,85
VISCOSITY: (cP)	179	-	483 (Rem. 15)

- SPECIFIC HEAT Cp (BTU/lb °F)
- CORROSIVE/EROSIVE AGENTS DESCRIPTION
  - ● EROSIVE Sand ○ CORROSIVE
- CHLORIDE CONCENTRATION (ppm) N/A
- H2S CONCENTRATION (ppm)
- FLUID ○ HAZARDOUS ○ FLAMMABLE ○ OTHER
- ○ GAS ○ ENTRAINED ○ SLUG FLOW % BY VOLUME or GVF
- ● SOLIDS PARTICLE SIZE DISTRIBUTION & MIN/MAX 3000 (Rem. 13) (μ)
- ○ SHAPE ○ CONCENTRATION ○ HARDNESS

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Pengadaan Booster Pump Package Batang HO & KBJ Junction SLC

Pump Package Selection

Selected Pump Type : Screw Pump API 676

Model (L4) : Twin Screw Pump with Timing Gears

Key Reasons :

1. Standardized design, allowing direct interchange between sites
2. Suited for fluctuating suction & discharge conditions
3. Non-pulsating (designed for parallel operation with multiple pumps)

Mech Seal : Double Acting Mech Seal With Plan 53B

Key Reason : 1. Prevent leakage from process liquid
2. API 682 compliant

Supporting Equipment : MV Motor 400 kW & MV VSD 500kW

Pengadaan Booster Pump Package Batang HO & KBJ Junction SLC

Project Management – Best Practices

Scope & Planning	: Doing Routine Consignment meeting with Pertagas & EPCI
Procurement	: Execute purchase of the Long Lead Item & Enhance Local Material (Skid) for TKDN
Scheduling	: Master Schedule & Buffer
Risk Management	: 1. Learning from past project references in similar applications
	2. Raise awareness to all parties to prevent similar mistakes from happening
Execution	: 1. Weekly update meeting with all parties and key suppliers
	2. On-time submission of key documents
Integration FAT	: Supervision by key suppliers (e.g. Leistritz, John Crane, WEG)
Commissioning	: 1. Prepare checklist and all necessary documents & tools in advance.
	2. Supervision by key suppliers (e.g. Leistritz, John Crane, WEG)

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Key Challenges & Mitigation Strategies

Key Challenge	Mitigation Strategy
Short delivery time	Execute Long Lead Item, Air Freight, and Locally source
Wide range of suction pressure	Pump & seal selection becomes critical where Leistritz has extensive experience in similar applications
Solid particle & abrasive fluid	Select suitable pump material (Stellite coated) & mech seal material (hard face), seal system settings
Requirement for API 682 Cat 3 compliance & limited available selection from the seal vendors	Work closely with reputable seal vendors and always seek approval from client / end user with regards to mech seal selection and seal plan design
Scope changes during execution phase	Applied structured change management with formal documentation and approvals
Expedited material delivery on site (Requested from end user)	Close follow up with sub-vendors, partial delivery of items to MKAPR workshop for assembly

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Lessons Learnt

1. Unfamiliar Commissioning Procedure – Seal Plan 53B Venting

- **Issue:** During commissioning, operators were unfamiliar with the proper venting procedure of the Seal Plan 53B circuit
- **Impact:** Trapped air in the seal system → Seal face overheating, poor barrier fluid circulation.
- **Lesson:**
  - Incorporate step-by-step venting procedure in commissioning checklist.
  - Pre-commissioning briefing & training for site operators/technicians by seal vendor

2. Premature Seal Leakages due to Seal Face Overheating

- **Issue:** Mechanical seals experienced **premature leakage** from **overheating of seal faces**.
- **Root Cause:** Insufficient barrier fluid circulation or trapped air.
- **Lesson:**
  - Monitor temperature differential across the seal pot during startup.
  - Ensure correct pre-fill and pressurization & venting procedure (prevent trapped air) before pump startup.
  - Change of circulating pump speed to slower → Minimize turbulence at the gland area and enhance heat absorption by the barrier fluid to reduce heat buildup at the seal faces

3. Frequent Bearing Oil Refilling & Pressure Buildup

- **Issue:** Overly frequent refilling of bearing oil → Overpressure in bearing housing → Oil sipping through seal drain pot
- **Lesson:**
  - Implement scheduled oil level inspections post pump shutdown (settle down) rather than reactive refilling.
  - Check breather/vent on bearing housing to prevent pressure buildup.

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Conclusions

- Combine Project Management & Product Management
- We are committed to close collaboration with our customers from project initiation to completion.
- Our focus is on long-term reliability, safety, and ease of maintenance.
- We provide continuous support during commissioning and beyond to ensure sustained operational success.
- Best practice = solid planning + right equipment + proactive communication
- We are always ready for future collaboration in similar projects

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TERIMA KASIH