



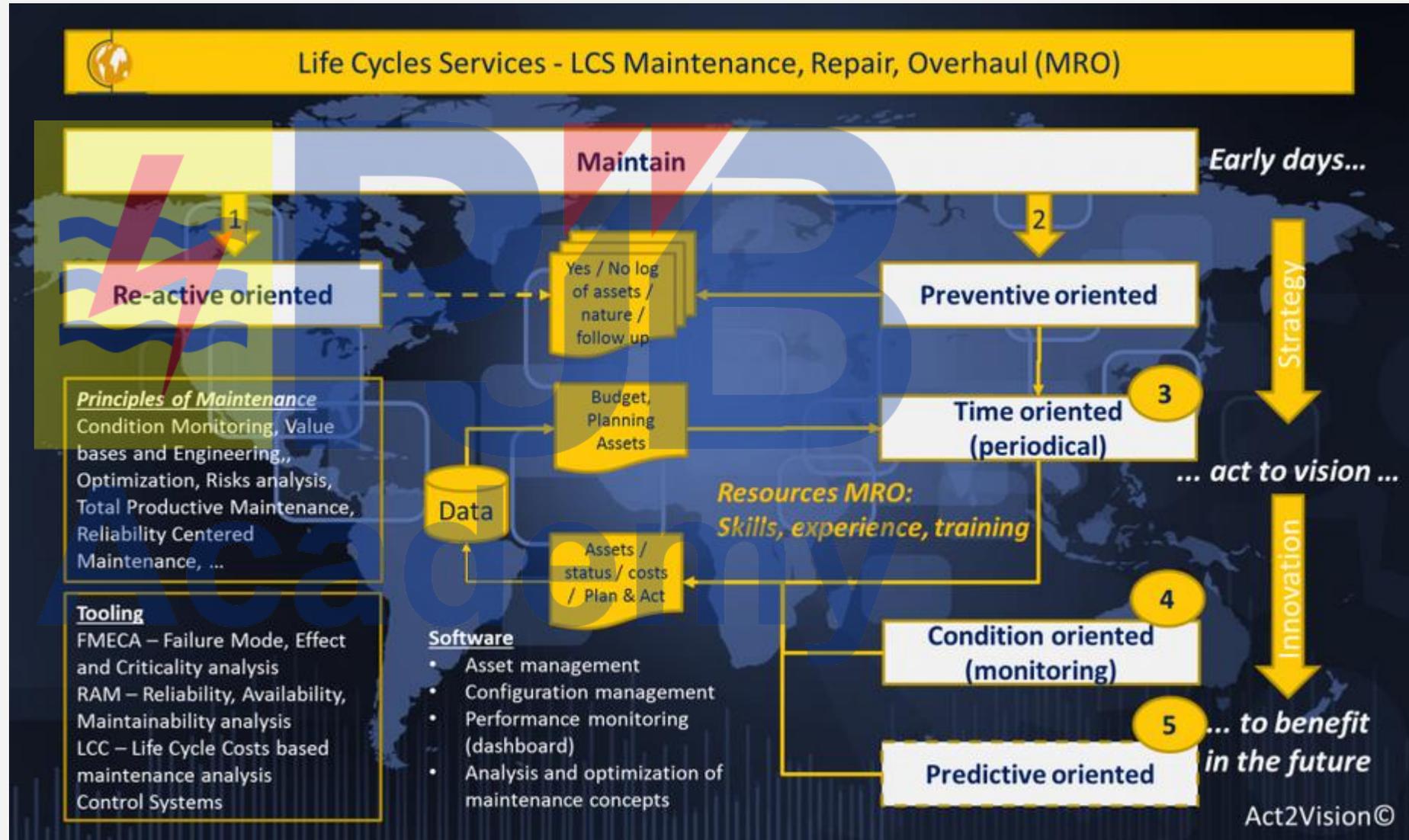
Maintenance Repair Overhaul (MRO) Solutions to Deliver Performance Assurances

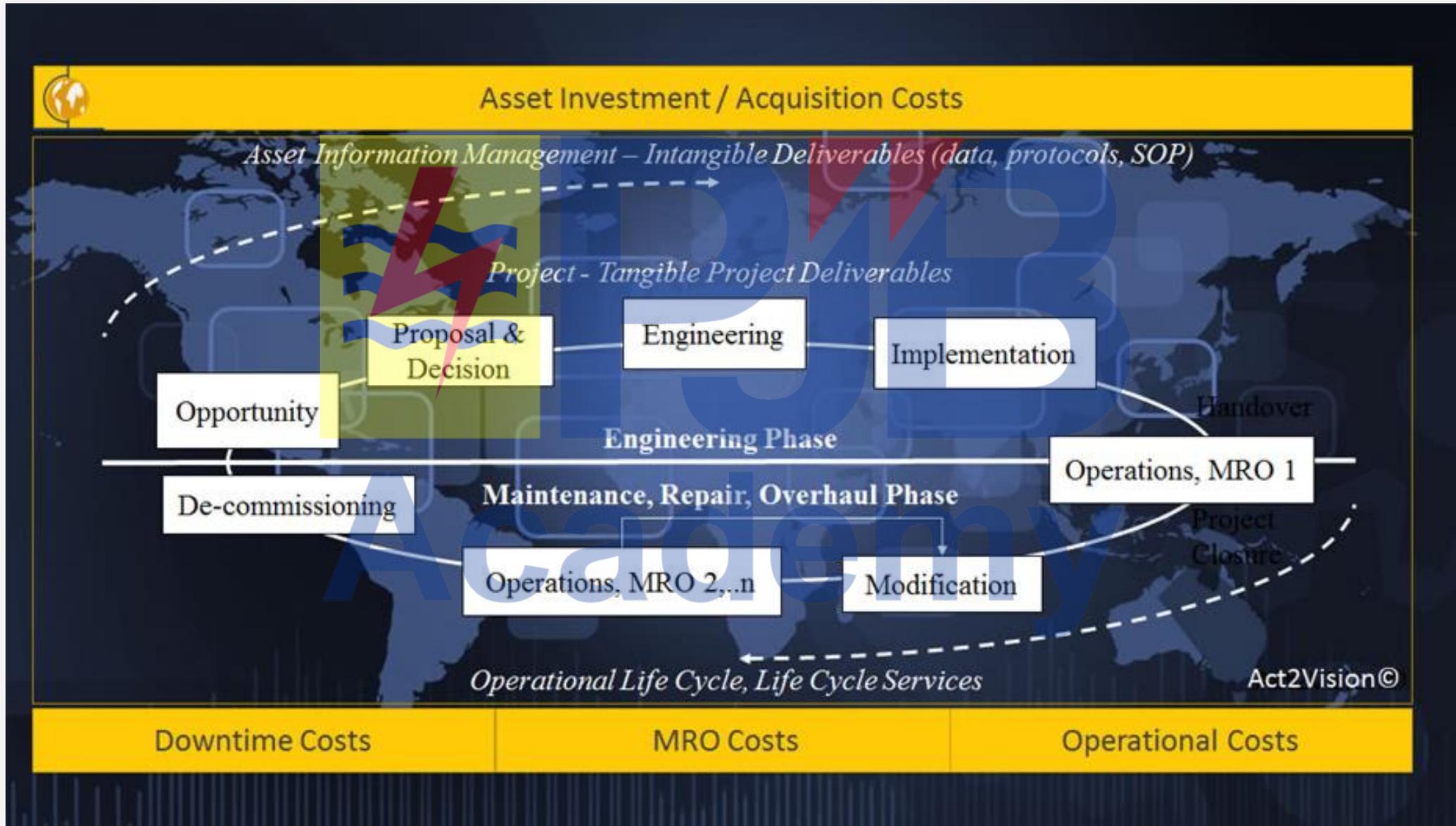


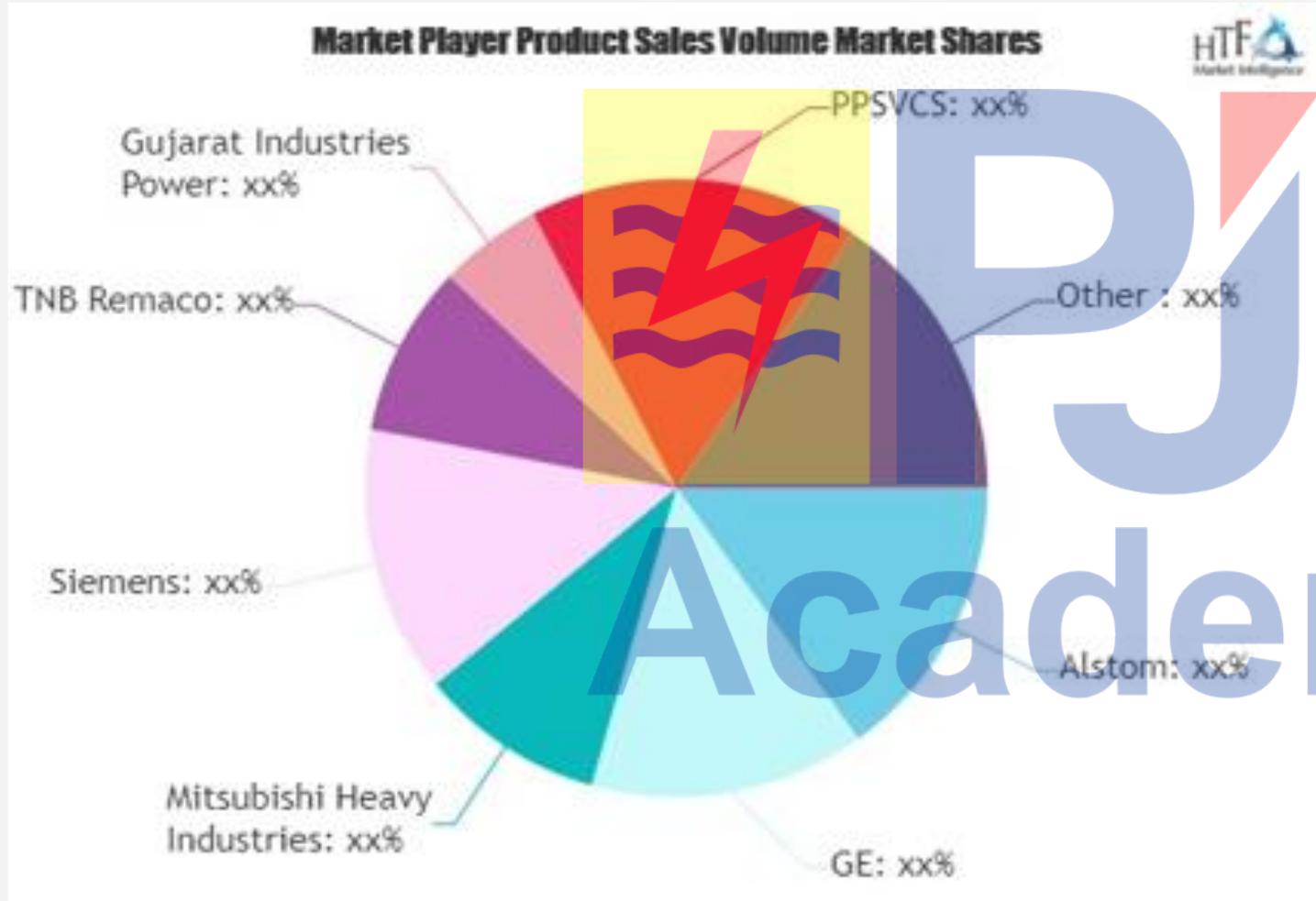
Site Plan PLTS Apung Cirata

LIFE CYCLE SERVICES- MRO

“ Without MRO of your people, your assets life cycle will be shorter than planned, whatever principle, tool or software you use “







Global Power Plant Services Market Forecast Study till 2026

PJB Academy

PANDEMIC COVID-19 CHANGES EVERYTHINGS

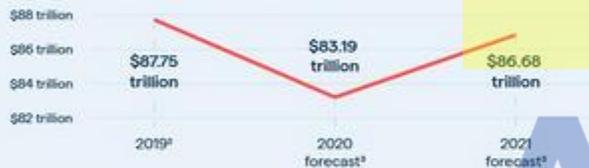
The economic impact of coronavirus

Global GDP forecasts

Global GDP is forecast to fall by 5.2% in 2020 as a result of the coronavirus pandemic.¹

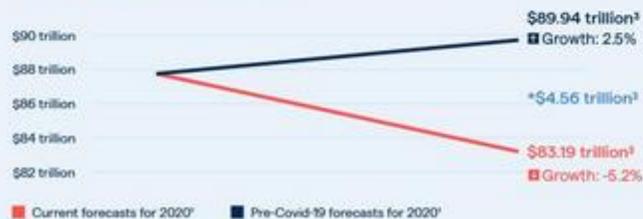


Global GDP in US dollars



How do these numbers compare to pre-crisis estimates?

Before the crisis, GDP was forecast to grow by 2.5% in 2020 to reach \$89.94 trillion.³



¹ World Bank, 2020. Global Economic Prospects, June 2020. Washington, DC: World Bank, DOI: 10.1596/978-1-4648-1553-9. License: Creative Commons Attribution CC BY 3.0 IGD. ² World Bank, 2020. License: Creative Commons Attribution CC BY 4.0. ³ Estimated GDP figures for 2020 and 2021 were calculated using the global percentage growth forecasts from source 1 and the 2019 GDP estimate from source 2.

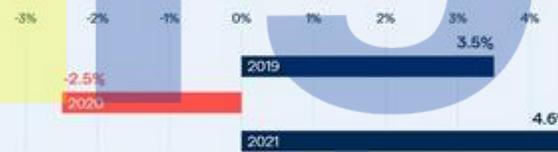
How do the forecasts vary around the world?

The average fall is expected to vary according to countries' economic status.

Growth in advanced economies¹ (eg the US, eurozone and Japan)

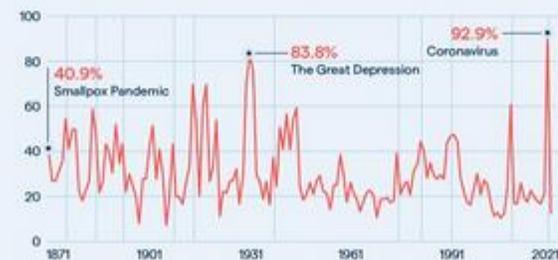


Growth in emerging markets and developing economies¹ (eg China, Nigeria, Bangladesh)



Share of economies in recession 1871-2020¹

A higher percentage of countries are forecast to go into recession in 2020 than at any other time since 1871 – the last time a global recession was triggered purely by a pandemic.



What shape will the recovery take?

Economic recovery will vary by region, and could take several different forms.

V-shape: The economy recovers but only to pre-crisis levels

U-shape: The economy recovers to pre-crisis levels but more slowly than it would in a V

Tick-shape: The economy recovers to pre-crisis levels faster than it would in a U but more slowly than it would in a V

Z-shape: The economy is driven above pre-crisis forecasts due a surge of economic activity as lockdowns ease

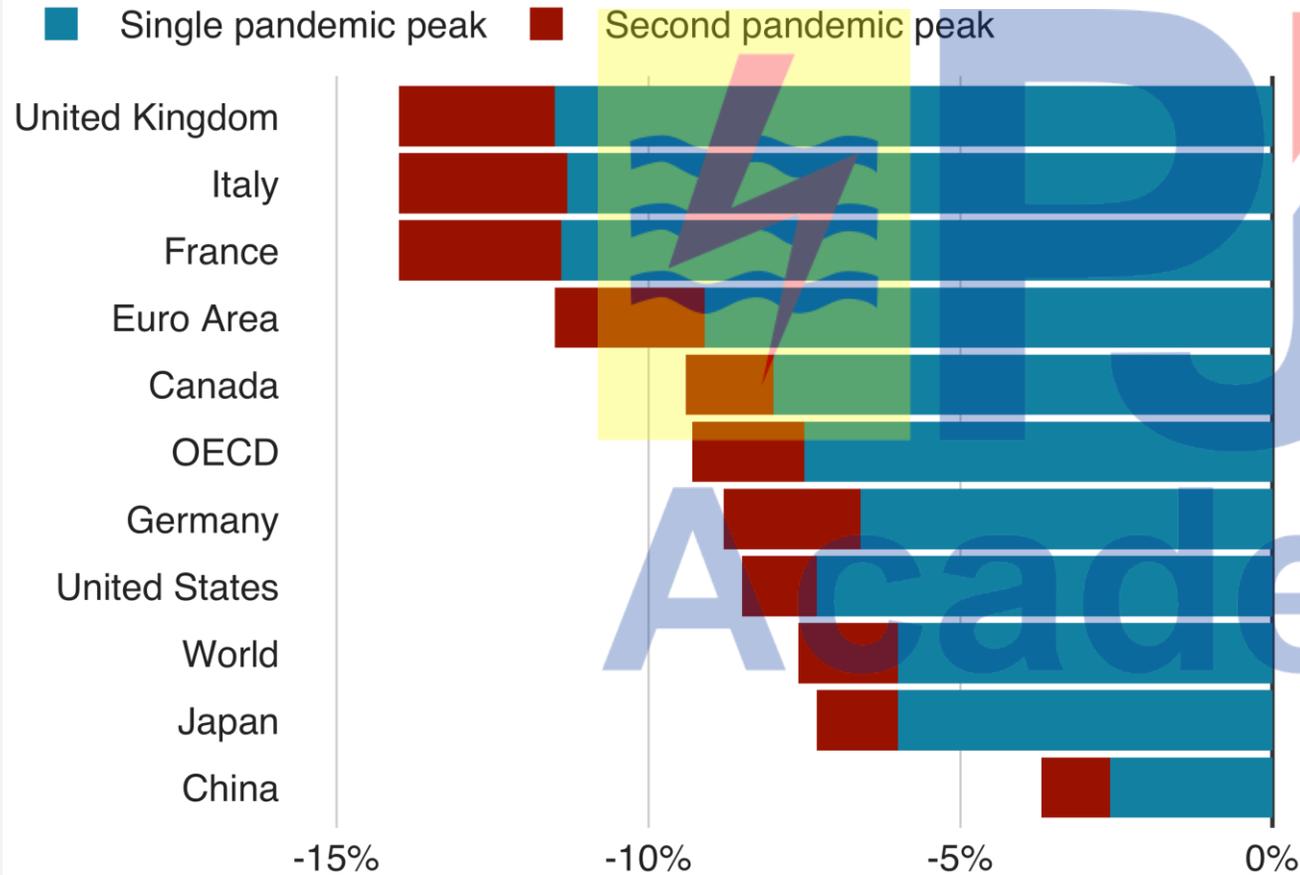
W-shape: The economy begins to recover but dips because of a second wave of infections

L-shape: The economy recovers too slowly to catch up pre-crisis GDP forecasts

PANDEMIC COVID-19 CHANGES EVERYTHINGS

Pandemic hits UK economy the hardest

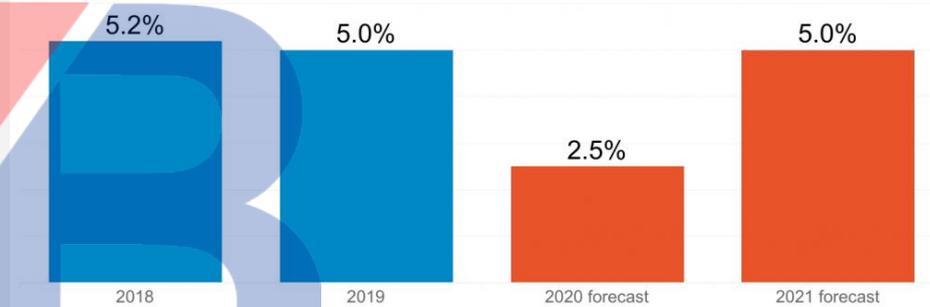
2020 projected change in GDP by scenario



Source: OECD



Indonesia
GDP growth forecasts



Source: Asian Development Bank, *Asian Development Outlook 2020* (April 2020)

#ADO2020





1. Improving Tactical Maintenance (PM, PdM)
2. Advance planned shutdowns (RBI, Repairs on-site & Extended Intervals)
3. Maximizing Resources Utilization (MRO Tools & Skills)
4. Specify Budget Cuttings (Wild Importance Goals)
5. Advance SCM (Right Spare - Just in Time)



DIROP1



COST OPTIMIZATION
SUPPORT GO TO MARKET

DIROP 2



PLANT PERFORMANCE IMPROVEMENT

Strengthen the Core → Go to Market



1. i-Predict & Lvl 1 Assessment Pembangkit

Mengimplementasikan Program Digitalisasi PdM & Assessment level 1 pembangkit untuk mengurangi EFOR



2. Optimasi Asset

1. Mengoptimalkan biaya pemeliharaan dengan melakukan repair di workshop MRO sebagai maintenance supporting.
2. Mendukung unit untuk mengoptimasi scope work overhaul dengan metode Risk Based Inspection (RBI)
3. Meng-utilize idle asset tools, workshop dan sumber daya manusia (SDM) untuk meningkatkan produktifitas



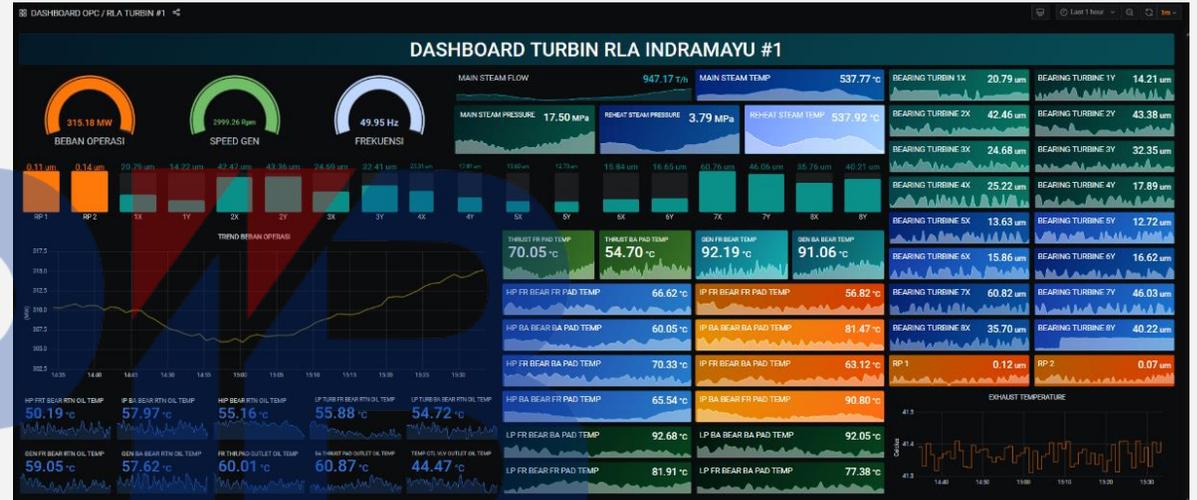
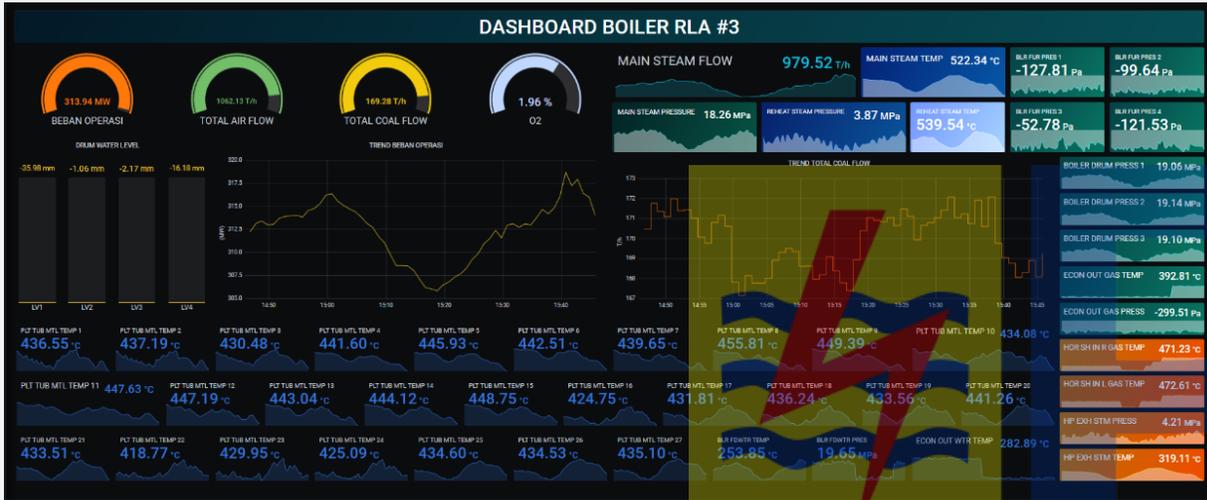
3. Pengembangan Bisnis

1. Menyiapkan workshop MRO dengan memperkaya portofolio repair untuk mendukung pengembangan bisnis MRO
2. Menyiapkan produk bisnis assessment pembangkit:
 1. Total plant assessment
 2. Partial plant Assessment
 - Online Assessment
 - Offline assessment

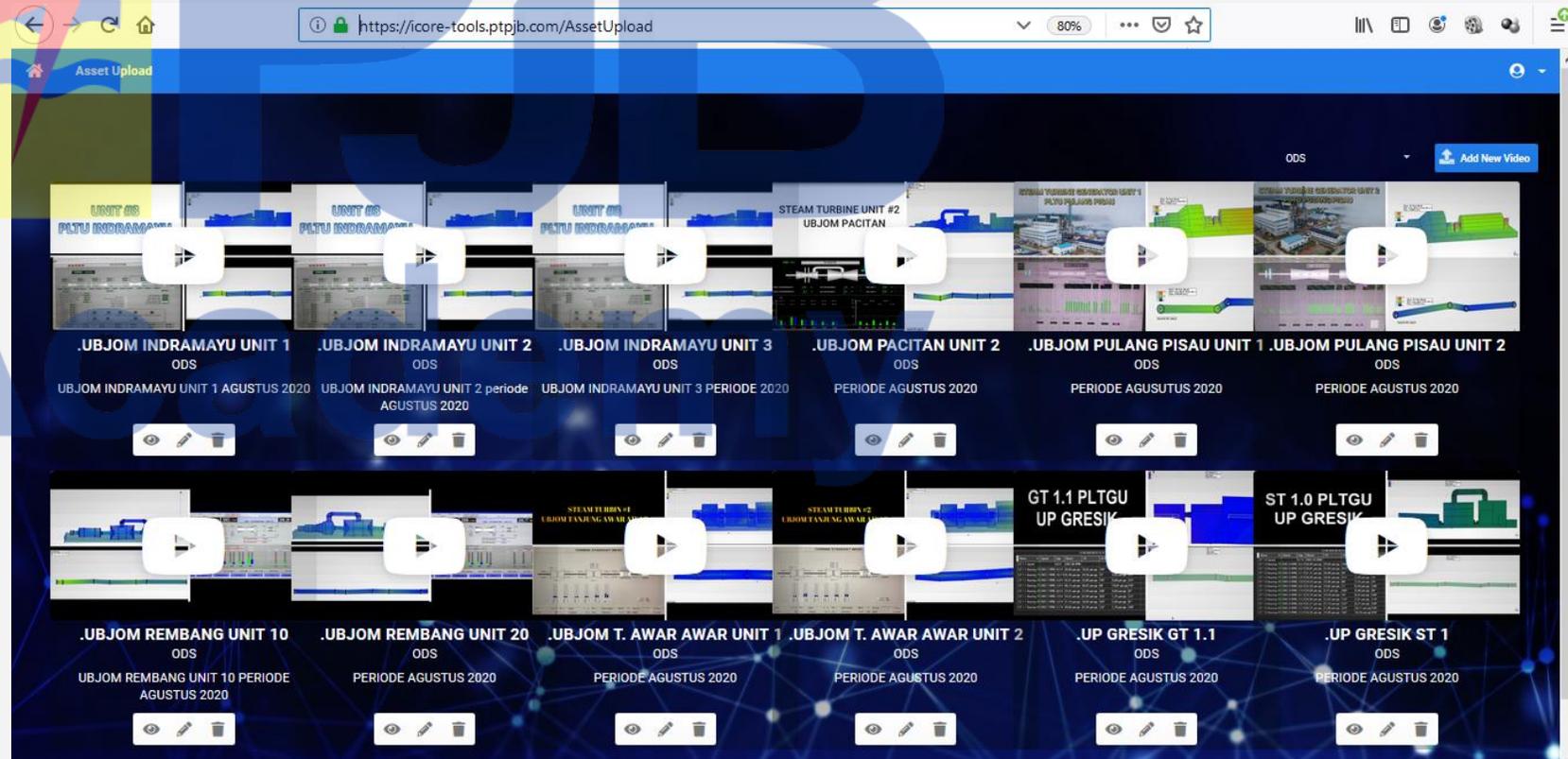
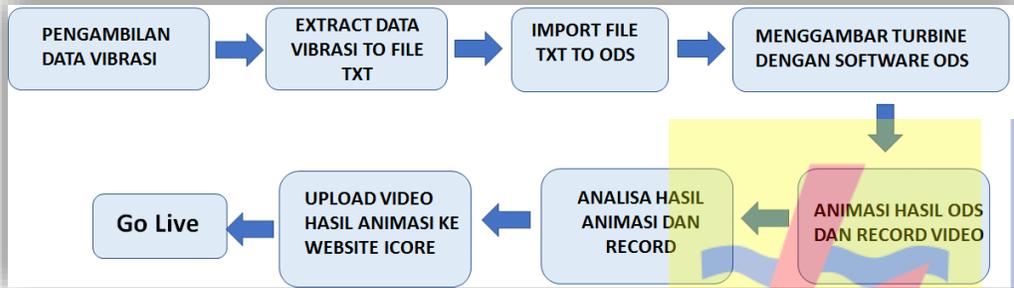


4. Recovery Supporting & Creating Expert

1. Memverifikasi RCFA Top 20 Pareto Loss Output – Workshop RCFA
2. Memberikan support recovery pembangkit dengan menurunkan expert (create expert unit) untuk percepatan down time



PdM : ODS on i-Core



PJB Total Services Solution

PJB Total Services Solution provides integrated solutions such as Maintenance, Repair and Overhaul for power generation and other industrial utility. Supported by experienced competency resources with certification of expertise and tools for assembly / disassembly, measurement, calibration, online maintenance, assessment and repair. We are ready to provide services of the highest quality according to needs and cost-effective.

Products and its derivative:

Maintenance & Assessment



1. Predictive maintenance (PdM)
PdM Setup, Training & Analysis.
Field Balancing
2. On/off-line maintenance
online oil purifying, online HRSG/Boiler Cleaning
3. Plant / Equipment Assessment
Complete Plant Assessment or Equipment Assessment:
Boiler, Turbine, Transformer, Generator, Civil
Equipment, Coal Handling Facility, Fire Protection
4. Technical Advisor

Repair & Calibrations



1. In-situ Repair
Rotor turbine/ generator welding,
straightening, polishing & Balancing.
Motor Rewinding, resetting valve & repair,
2. Workshop Repair
Support with lathe manual/CNC, Welding,
Cutting, Drilling, rolling plate , bend
plate/tube on workshop

Overhaul & Technical Supporting Services



Experienced Overhaul / Inspection for wide range Steam, Combine Cycle, Hydro, Coal, Solar Power Plant Turbine from < 50 MW , 50 – 300 MW & > 300 MW.



WORKSHOP REPAIR





IDEATION PROCESS



ASSETS

Expert (Field Services / Engineering)
Subject Matter Expert
Experiences over 25 yrs.



Resources

> 100 jenis tools assy / disassy, machining, welding, repair valve, dan rewinding motor, serta 1 unit lab



Tools

34 workshop diseluruh unit yg dikelola tersebar di seluruh Indonesia



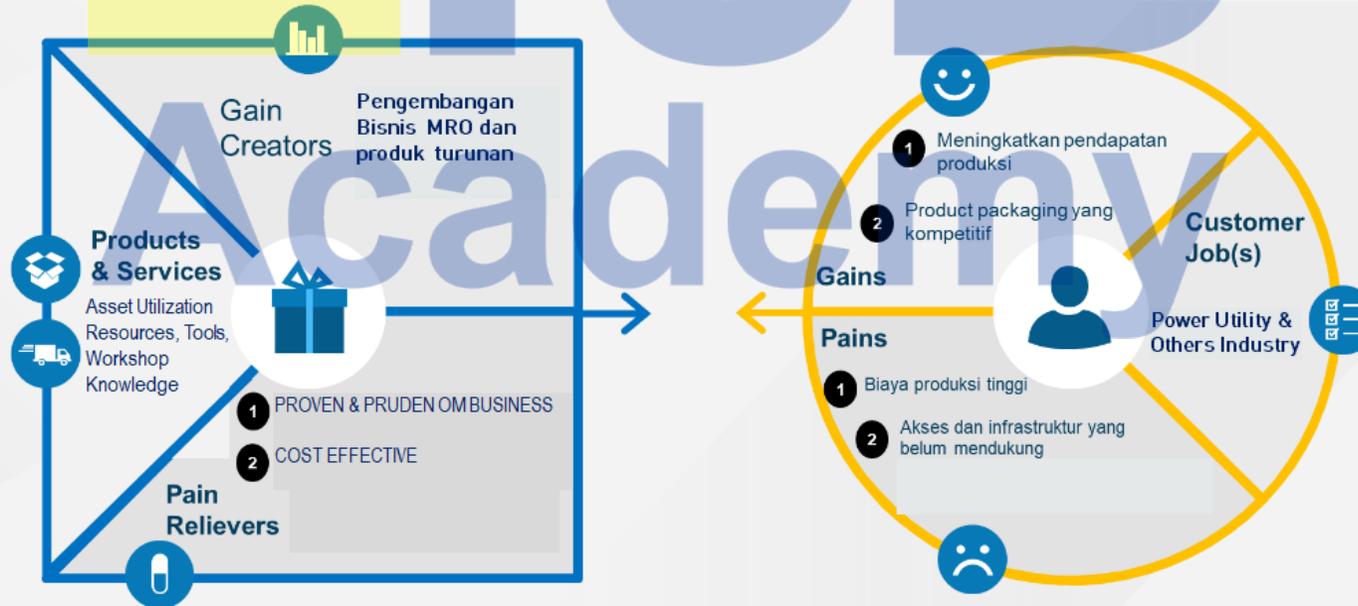
Workshop

Know-how Overhaul, Inspection, Assessment, Repair, Fire Protection, etc



Knowledge

PETA EMPATI BERBASIS VALUE PROPORTIONAL CANVAS



WORKSHOP REPAIR MUARA KARANG



- Precision
- Calibration
- Reverse engineering

WORKSHOP REPAIR GRESIK



- Contruction
- Balancing
- Electrical

WORKSHOP REPAIR PAITON



- Pressure part
- Tube & Pipe

Academy

KEMUDAHAN AKSES

WORKSHOP REPAIR GRESIK

JETTY



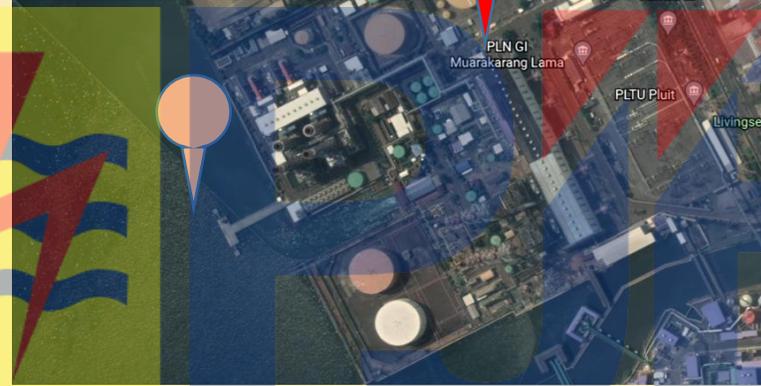
Jarak : 1 - 1.9 KM

TOL : Romokalisari



WORKSHOP REPAIR MUARA KARANG

JETTY



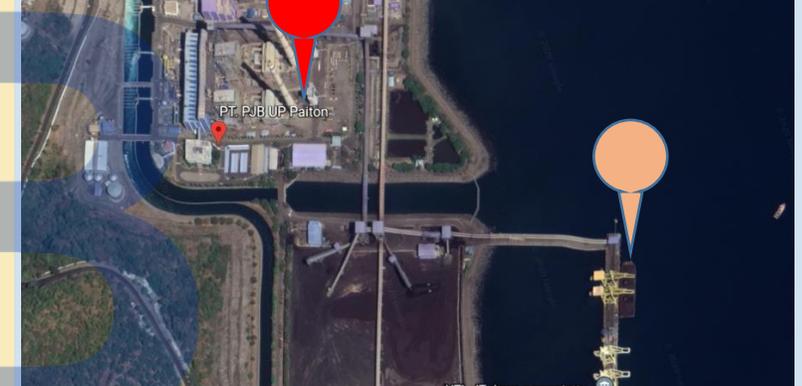
Jarak : ~ 500 M

TOL : Pluit



WORKSHOP REPAIR PAITON

JETTY



Jarak : ~ 850 M

TOL : Probolinggo Timur



Lokasi Workshop



Lokasi Jetty



ISO 9000



ISO 14001



OHSAS

SERTIFICAT TACHNICAL ADVISOR STEAM TURBINE_MHPS



GT MAINTENANCE INFORMATION		Doc. No. WGFE16-0047	Rev. 2
		Date : 2017 - feb 23	
Customer P.T. PEMBANGKITAN JAWA BALI	Department/Section Power Systems Service Headquarters Takasago Power Systems Service Department Field Service Planning Group		
Project Indonesia O&M Collaboration	Prepared	MHPS-SC S.Teruya	MHPS S. Higuchi
	Checked	N.Morinaga	S. Higuchi
Subject Capability Evaluation of Mr.Yulianto Kartono	Approved	K.Nitta	F. kobayashi



M. NASRUDDIN



WAHYUNIANTO S.



ROHMAD ISKANDAR



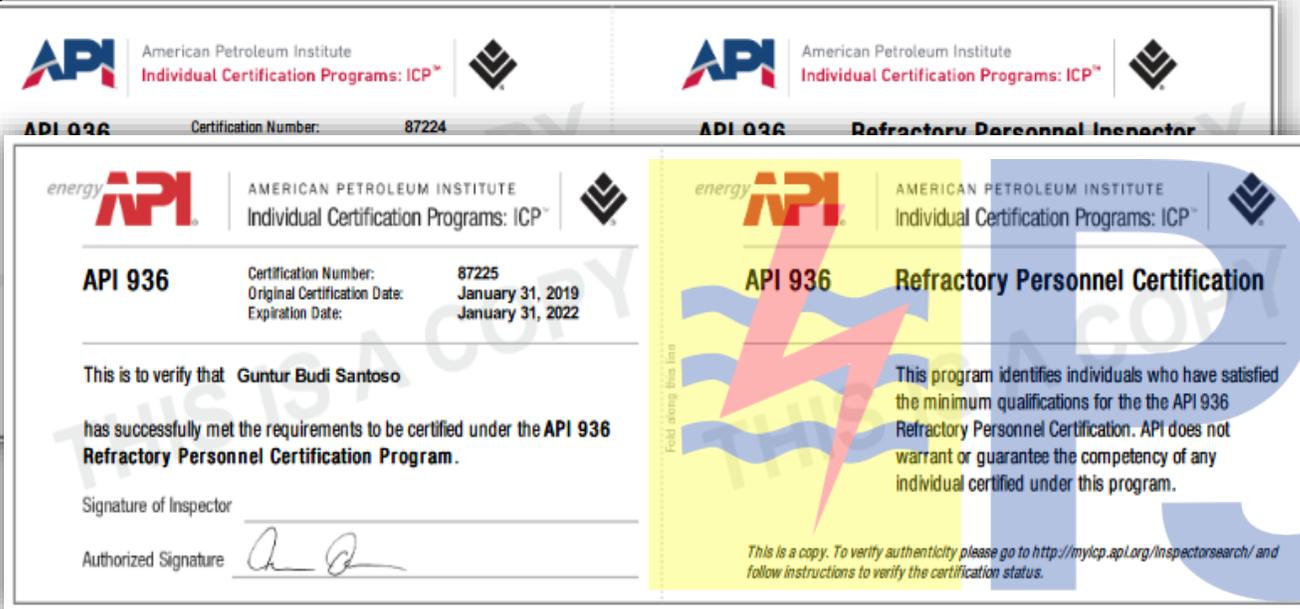
ANWAR HAMIDI



RIO PUDJIDARMA
SANTOSO



HASRINUKSMO
NUKIANDI



API 936 American Petroleum Institute Individual Certification Programs: ICP™

Certification Number: 87224

API 936 Refractory Personnel Inspector

energy API AMERICAN PETROLEUM INSTITUTE Individual Certification Programs: ICP™

API 936 Refractory Personnel Certification

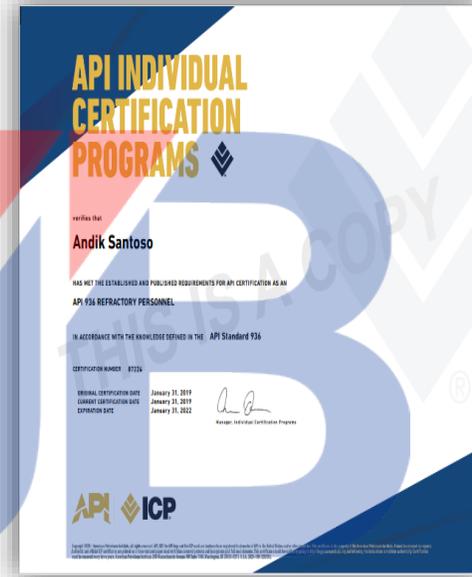
Certification Number: 87225
Original Certification Date: January 31, 2019
Expiration Date: January 31, 2022

This is to verify that **Guntur Budi Santoso** has successfully met the requirements to be certified under the **API 936 Refractory Personnel Certification Program**.

Signature of Inspector _____
Authorized Signature 

This program identifies individuals who have satisfied the minimum qualifications for the API 936 Refractory Personnel Certification. API does not warrant or guarantee the competency of any individual certified under this program.

This is a copy. To verify authenticity please go to <http://myicp.ap.org/inspectorsearch/> and follow instructions to verify the certification status.



API INDIVIDUAL CERTIFICATION PROGRAMS

verify that **Andik Santoso**

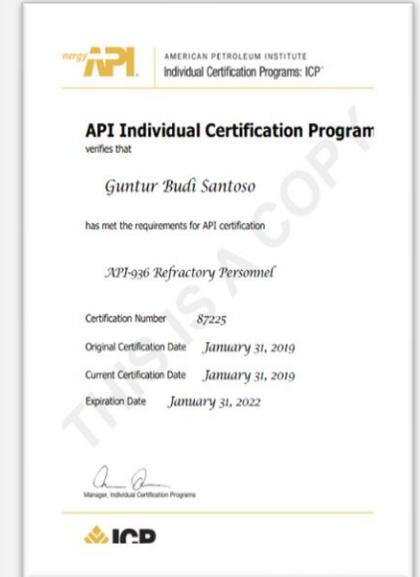
HAS MET THE ESTABLISHED AND PUBLISHED REQUIREMENTS FOR API CERTIFICATION AS AN **API 936 REFRACTORY PERSONNEL**.

IN ACCORDANCE WITH THE KNOWLEDGE DEFINED IN THE **API Standard 936**

CERTIFICATION NUMBER: 87225
ORIGINAL CERTIFICATION DATE: January 31, 2019
CURRENT CERTIFICATION DATE: January 31, 2019
EXPIRATION DATE: January 31, 2022


Manager, Individual Certification Programs

API ICP



API Individual Certification Program verifies that **Guntur Budi Santoso** has met the requirements for API certification.

API-936 Refractory Personnel

Certification Number: 87225
Original Certification Date: January 31, 2019
Current Certification Date: January 31, 2019
Expiration Date: January 31, 2022


Manager, Individual Certification Programs

ICP



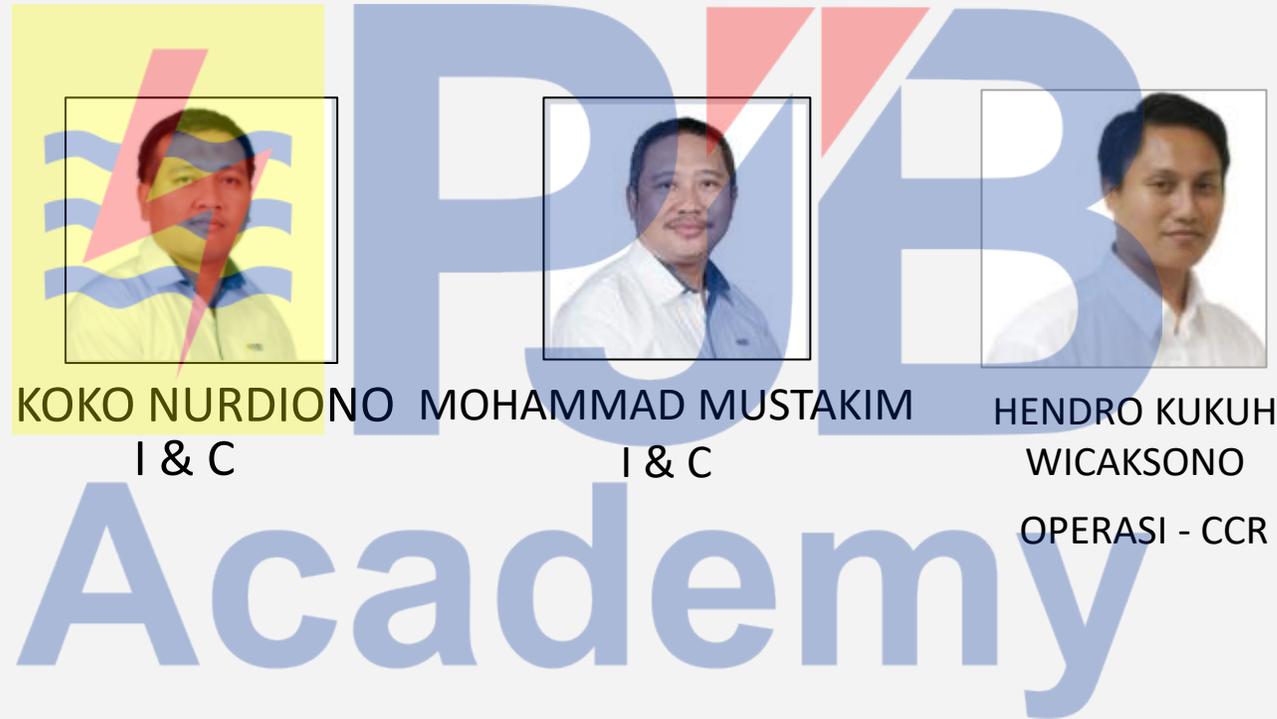
Andik Santoso



Guntur Budi Santoso

Academy

SERTIFICAT INSTRUKTUR O&M-TEPCO



SERTIFICAT MAINTENANCE TRAINING EXPERT (MTE)



MUJIDAN AKBAR
ELECTRICAL



RIYO PURNOMO
ELECTRICAL



JENDRO UTOMO
ELECTRICAL



MUHAMMAD AL AHYUDI
EXPERT OF I & C SYSTEM



DHIAMA
AKHIRIYANTO
MAIN GENERATOR



DEDI
TRICAHYONO
TRANSFORMATOR

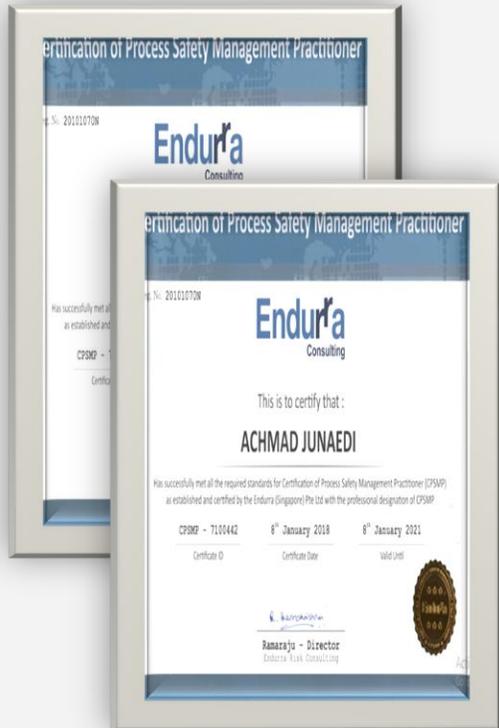


ROHMAD
ISKANDAR
BOILER PRESSURE PART
& ACCESSORIES



PRIYO HUTOMO
COAL-ASH HANDLING
SYSTEM

SERTIFICAT PROCESS SAFETY MANAGEMENT (PSM)



BALANCING



Tranposable Balance Machine



Low Speed Balancing Machine (LSBM)



Induction Heating



Dry Ice Blasting
Cap : 30 kg

MACHINING TOOLS



Mesin Bubut dia 200 x 1500 mm



Lathe Machining
Cap : 600 x 5000 mm



Bend Plate Machine
Cap : 25 x 1220 mm



Cutting Plate
Cap : 1 - 10 mm



Scrap Machine
Cap : 500 - 500 mm



PWHT



Test Bench - Pressure Capacity : max. 250 bar



Tube Expander
Ukuran Nozzle: 25.4 mm



Hydraulic Torque Wrench



Drilling Machine
Cap : 600 x 5000 mm



Hydraulic Press Machine
Cap : 50 T



Drilling Machine
Cap : 1 - 50 mm



Hydraulic Press Machine (Banzai)



Mesin Gergaji Potong (Tsune)



Frais Machine Standard
Type : SB-4)



Frais Machine Standard
Type : SB-4)



Hydraulic Torque Wrench



Grinding Lapping Valve

TOOLS WORKSHOP MUARA KARANG

MACHINING TOOLS

MESIN BUBUT



PINDAD PL 1000



CNC - PINDAD PL 2000



HONOR SEIKI/VL-46G



Horizontal Lathe Pinacho
SP/165



Horizontal Lathe S90E
260

FRAIS (MILLING)



KNUT
H



MILKO 35 R



Bridgesopt,
Type TVY

DRILLING, BORING & CUTTING



Vertical drilling
machine TNW
13R



Boring
Power Matic



Boring
Ikeda Type Rms
9



Cutting
Power
Matic/143



Cutting
Gergaji Besi Tnw
Waalwijk
Holland



CUTTING
HTC

LIPAT, SENAI



Lipat: Dake



Lipat: Chicago



Lipat: Dake/66-50



Senai : Asada



Scrap: Jochnick &
Normans



Grinding : Okamoto



GRINDING : Surface Grinding PSG-
618

MACHINING TOOLS

MESIN BUBUT



MESIN BUBUT KEMAMPUAN BESAR
(Ø1000MM x L3000MM)



MESIN BUBUT KEMAMPUAN MENEGAH
(Ø600MM x L1500MM)



MESIN BUBUT PRESISI
(Ø100 MM x L500MM)

SKRAP, HIDROLIS, ROLL & FURNACE



MESIN PEMBUAT ULIR
(Ø100 MM)



MESIN SKRAP
(STROKE 600 MM)



MESIN HIDROLIS KOMBINASI
(THK19MM x L150MM)

MILLING, CUTTING & BORING



MESIN MILLING UNIVERSAL
(L1000 X W300 X H450 MM)



MESIN GERGAJI HORIZONTAL
(W500MM X H500 MM)



MESIN BOR TIANG
(Ø32 MM)



BOR LENGAN RADIAL
(Ø300MM x L475MM)



VERTIKAL
(W300MM W500MM X H250MM M X H300MM)



MESIN HIDROLIS POWER TEAM
(100 TON)



MESIN ROLL PLAT
(MINIMUM DIAMETER 40 CM)



MESIN PEMANAS TEMPA
(L950 X W950 X H800 (MM))



BOR LISTRIK VERTICAL
(Ø5/8")



MESIN GERINDA (BESAR, MENEGAH)
(3KW, 0.75KW)



MESIN GERGAJI GOROK
(W300MM X H300MM)



MESIN GERINDA POTONG DAN PERKAKAS UMUM
(Ø300MM x L475MM)



MESIN POTONGa HIDROLIS GUILLOTINE
(Ø30MM x L2900MM)



MESIN TEKAN HIDROLIS
(15 T)



OVEN
(VOL IM3 1000)



Diverter Gate



Hammer Ring Coal
Crusher



Grab Bucket



Valve



Tooth Plate Coal
Crusher



Impeller



Seal Plate Gas
Turbin PLTGU



PCV Boiler



Scapper

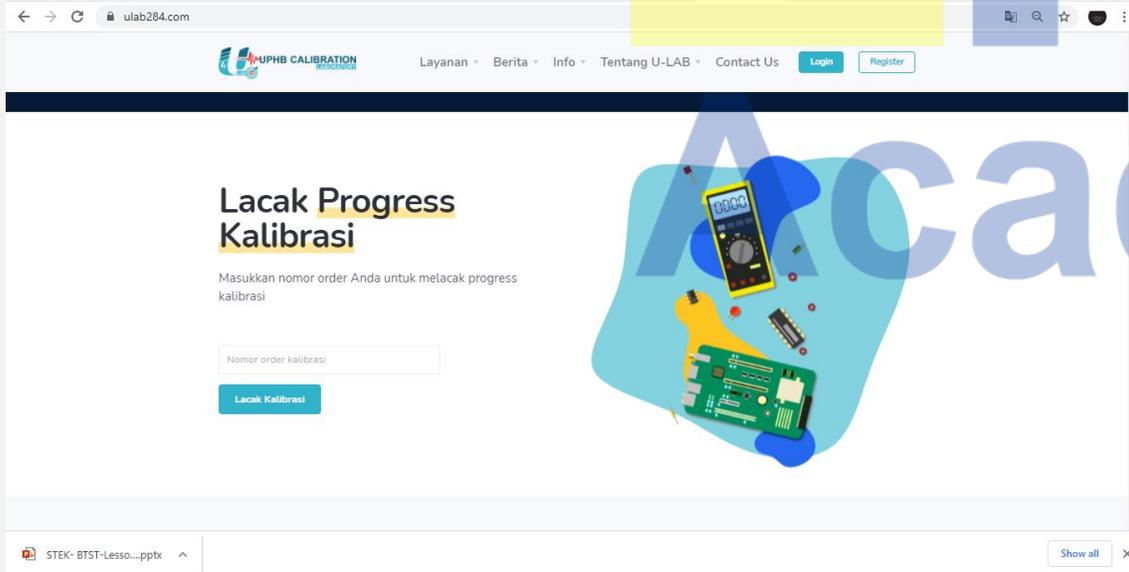




UPHB CALIBRATION
Layanan · Berita · Info · Tentang U-LAB · Contact Us Login Register

Implementasi SNI ISO/IEC 17025:2017 Laboratorium Kalibrasi PERTAMA di lingkungan PJB Group

ISO

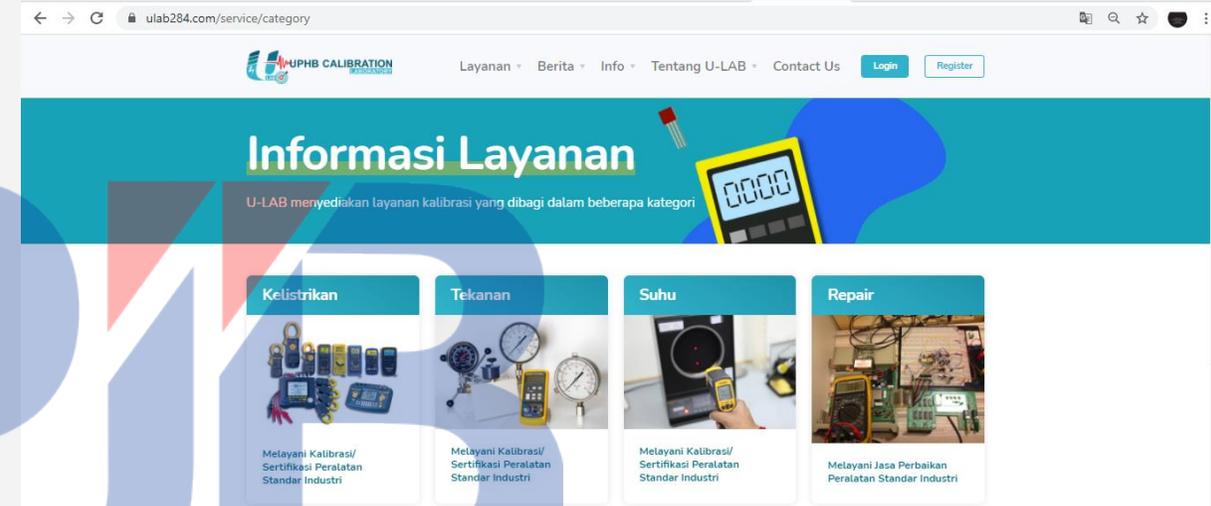


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Lacak Progress Kalibrasi

Masukkan nomor order Anda untuk melacak progress kalibrasi

Lacak Kalibrasi

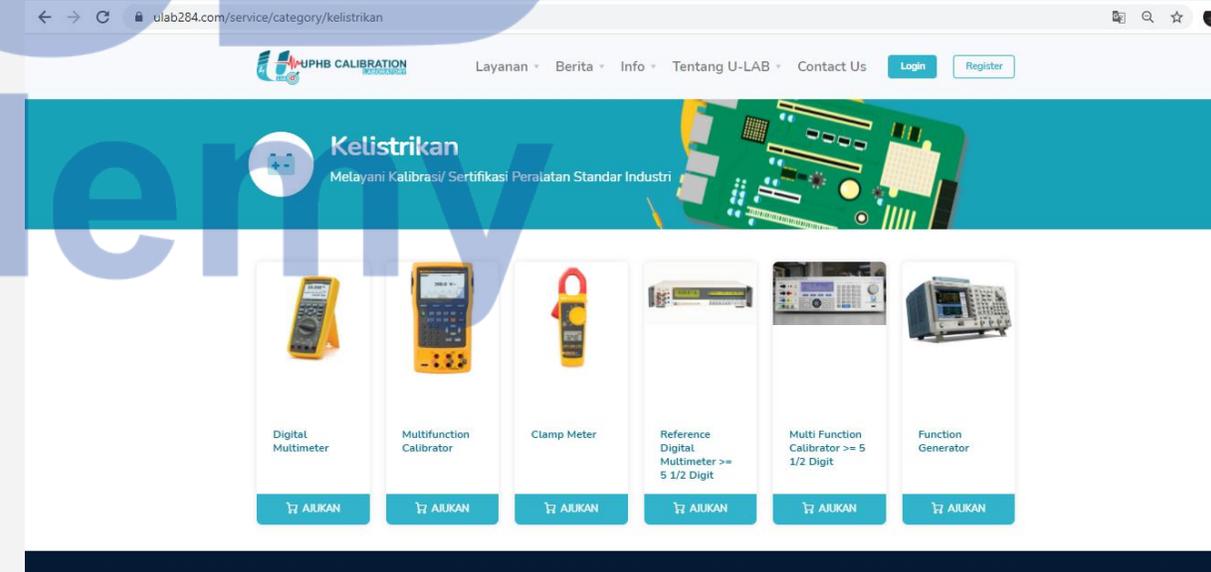


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Informasi Layanan

U-LAB menyediakan layanan kalibrasi yang dibagi dalam beberapa kategori

- Kelistrikan**
Melayani Kalibrasi/ Sertifikasi Peralatan Standar Industri
- Tekanan**
Melayani Kalibrasi/ Sertifikasi Peralatan Standar Industri
- Suhu**
Melayani Kalibrasi/ Sertifikasi Peralatan Standar Industri
- Repair**
Melayani Jasa Perbaikan Peralatan Standar Industri



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Kelistrikan

Melayani Kalibrasi/ Sertifikasi Peralatan Standar Industri

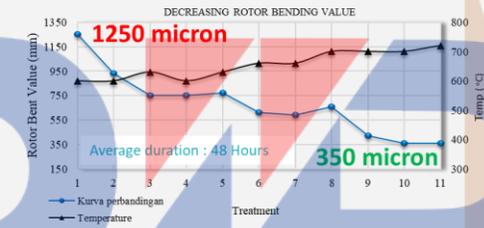
- Digital Multimeter
- Multifunction Calibrator
- Clamp Meter
- Reference Digital Multimeter >= 5 1/2 Digit
- Multi Function Calibrator >= 5 1/2 Digit
- Function Generator

SPECIAL CASE 1 : ROTOR TURBIN STRAIGHTENING PLTU PACITAN #1 (315 MW)



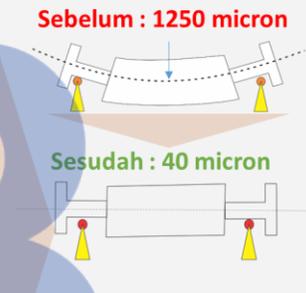
HASIL IMPLEMENTASI DAN EVALUASI ROBOD 600

THERMO-MECHANICAL : STEP BY STEP



Defleksi mengalami penurunan
Dari **1250 micron** menjadi **350 micron**

PENURUNAN BENDING



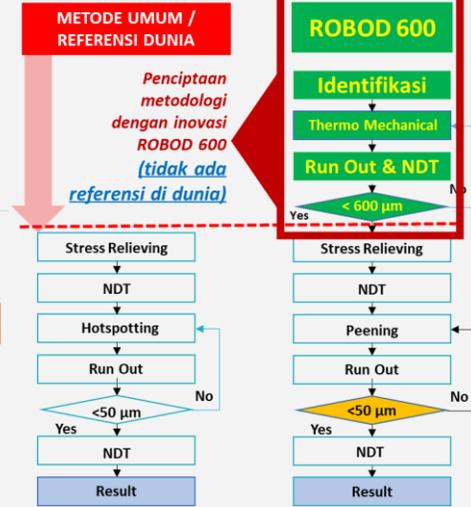
STRESS RELIEVING & PEENING



PENURUNAN GETARAN



PENCIPTAAN METODOLOGI BARU



PERMASALAHAN
STANDARD & Code

: ROTOR BENDING
: API 687

IMPLEMENTASI ROBOD 600

THERMO-MECHANICAL STRAIGHTENING



PEENING STRAIGHTENING

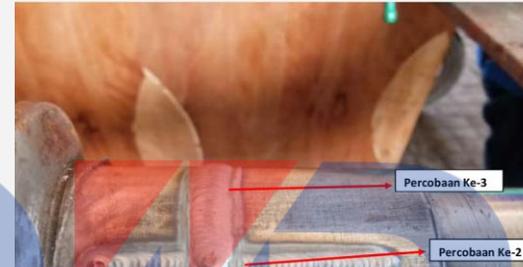


STRESS RELIEVING



MATERIAL INSPECTION





- Dari hasil pengujian yang sudah dilaksanakan dapat disimpulkan proses pengelasan dengan metode manual GTAW aman untuk dilakukan dari sisi ketahanan isolasi listrik maupun seal lead bus dengan interpass temperature maximal 80°C

- Waktu yang dibutuhkan untuk repair shaft rotor generator adalah 4 hari

- Pengujian MT hasil pengelasan mock up akan

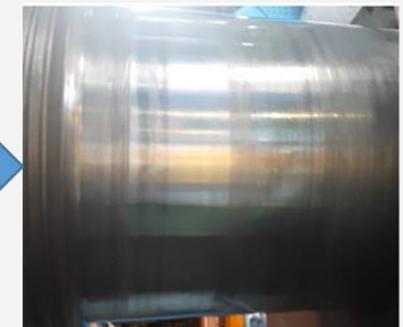
3. Simulasi waktu pengelasan

1. Diameter rotor 450mm, keliling 1415 mm. Masing-masing welder melakukan pengelasan sepanjang 708 mm
2. waktu tiap pengelasan sepanjang 50 mm 2 menit
3. jeda interval tiap pengelasan 10 menit
4. waktu yang dibutuhkan tiap welder untuk melakukan pengelasan per 1 layer adalah 169 menit
5. Lebar pengelasan 60 mm = 8 layer
6. total waktu tiap welder = 23 jam
7. Jam kerja efektif per hari adalah 6 jam
8. Total waktu repair 2 sisi pengelasan (turbine dan exitasi) dengan 4 welder adalah 4 hari

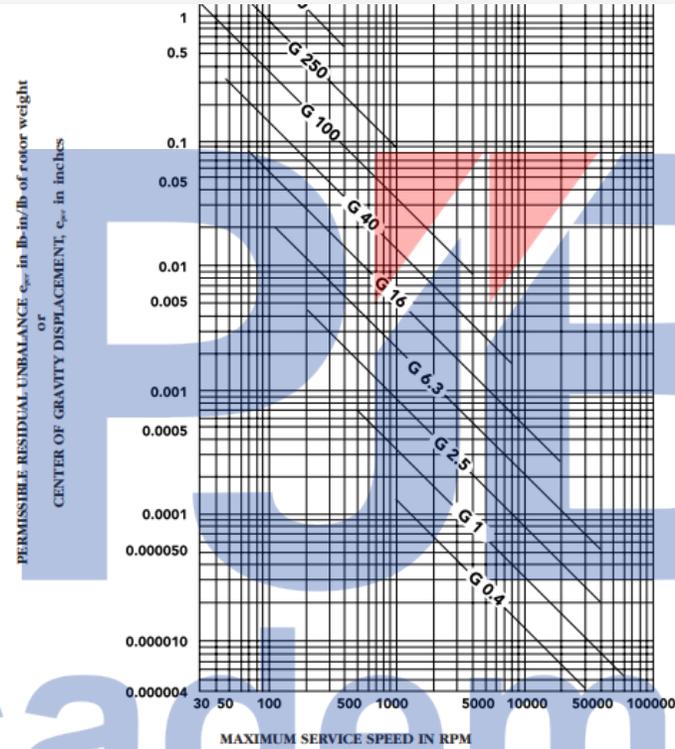
HASIL PENGUJIAN ROUGHNESS

Bagian	Titik ambil	Ra (μm)	Rz (μm)	Rz max (μm)
Turbin	Diluar machining	1.1	7.2	8.2
	Air Side	0.5	3.3	4.4
	Middle Side	0.3	2.9	5.4
	H2 Side	0.3	2.3	-
Exitier	Diluar machining	1.2	8.2	13.8
	Air Side	0.5	4.3	6.5
	Middle Side	0.5	3.1	3.7
	H2 Side	0.5	3.7	4.6

HASIL MACHINING



SPECIAL CASE 4 : LOW BALANCING ROTOR LP TURBIN 330 MW



COMPARING API, ISO & MIL-STD-167-1 BALANCE TOLERANCES

U_{per} = Permissible residual unbalance FOR EACH CORRECTION PLANE in ounce inches. (oz-in)
 W = Rotor Weight In Pounds. $W = 1000$ lbs. for all examples shown.
 N = Maximum Continuous Operating RPM.
 G = ISO Balance Quality Grade Number, i.e. 6.3, 2.5, 1.0 etc.

$F_c < 10\%$ Journal Static Load $U_{per} = \frac{56.347 \times (\text{Journal Static Load } W/2)}{N^2}$

ISO $U_{per} = \frac{G \times 6.015 \times W/2}{N}$

MIL-STD-167-1 $U_{per} = 0.177 W$ (0 to 150 RPM)
 $= 4000 W / N^2$ (150 to 1000 RPM)
 $= 4 W / N$ (Above 1000 RPM)

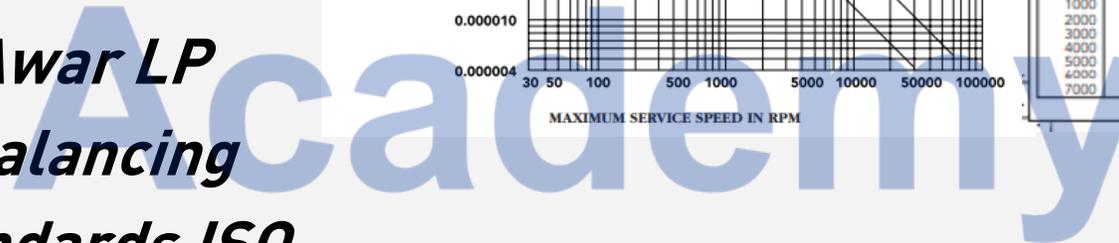
API $U_{per} = 4 W / N$ (W = Journal static Load)

$F_c = 1.77 (\text{RPM}/1000)^2$ (oz-in) [Centrifugal Force]

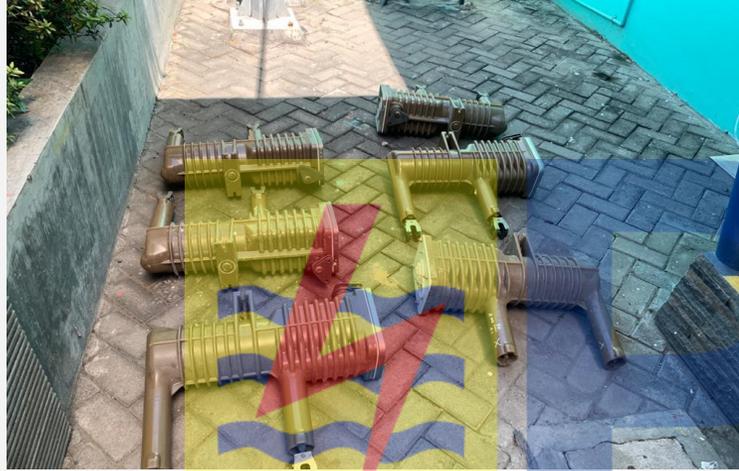
DATA TABULATION												
N	MIL-STD-167		ISO G 6.3		ISO G 2.5		ISO G 1.0		API		FC = 10%W/2	
	U_{per} oz-in	Centr. Force										
150	177	7	126.0	5	50.0	2.0	20.0	0.8	13.3	0.5	1252.0	50
500	16	7	38.0	17	15.0	6.6	6.0	2.7	4.0	1.8	113.0	50
1000	4	7	19.0	34	7.5	13.3	3.0	5.3	2.0	3.5	28.0	50
2000	2	14	9.5	67	3.8	26.6	1.5	10.6	1.0	7.1	7.0	50
3000	1.33	21	6.3	100	2.5	39.8	1.0	15.9	0.6	9.6	3.1	50
4000	1.0	28	4.7	133	1.9	53.8	.8	21.2	0.5	14.2	1.8	50
5000	.8	35	3.8	168	1.5	66.4	.6	26.6	0.4	17.7	1.1	50
6000	.7	42	3.2	201	1.3	79.7	.5	31.9	0.3	19.1	0.8	50
7000	.57	49	2.7	234	1.1	92.8	.4	37.3	0.3	26.0	0.6	50

Copyright 1999 IRD Balancing

**PLTU # 2.0 Tj. Awar-Awar LP
 Turbine Low-Speed Balancing
 Resulting on ISO Standards ISO
 1940 Grade 0.4**



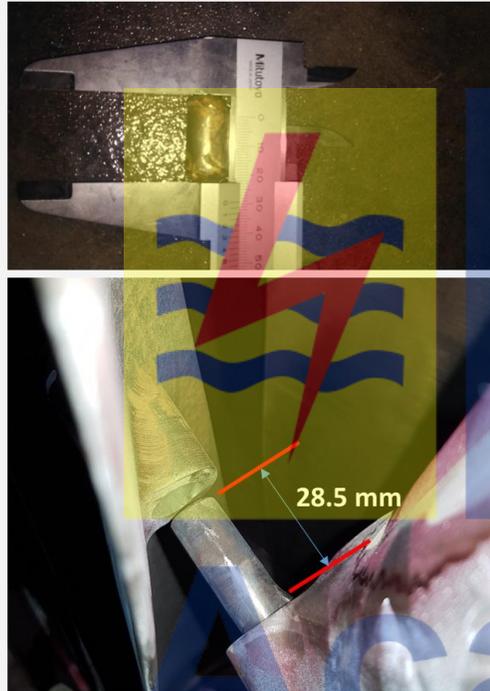
Special case 5 : Repair Electrical 20 Kv



Academy

Special case 5: Pengelasan Latching Wire UJTA

Failure komponen last Blade Awar-awar



Corrective action Lst Blade Awar-awar



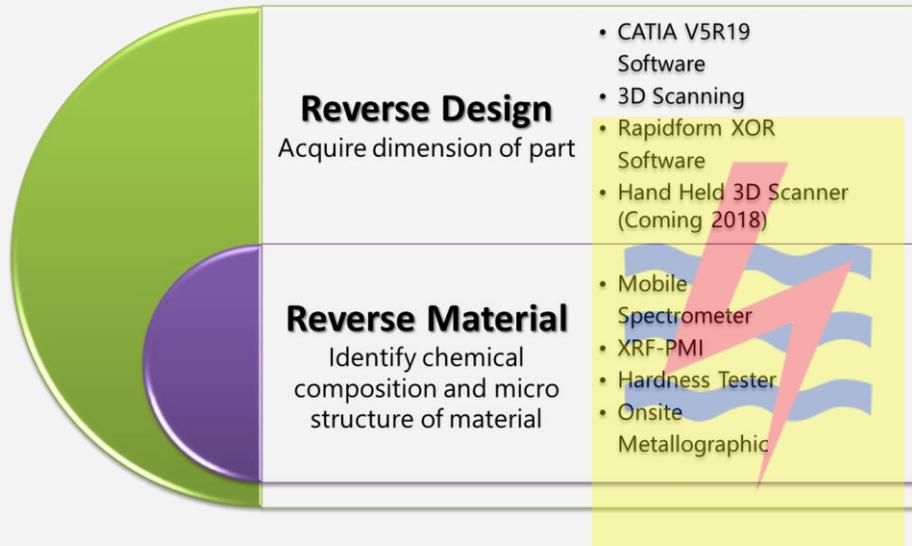
Latching Wire

Root dan groove



Special case 6: Reverse Engineering

Overview



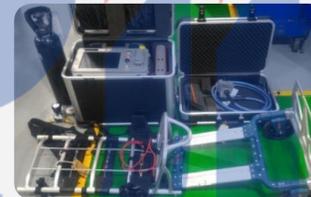
Metode & Teknologi



XRF - Chemical Composition Testing
Specification:
- Brand : HITACHI
- Type : X-MET 8000



3D SCANNER
Specification:
- Brand : CREAFORM
- Type : Handy Scan 3D



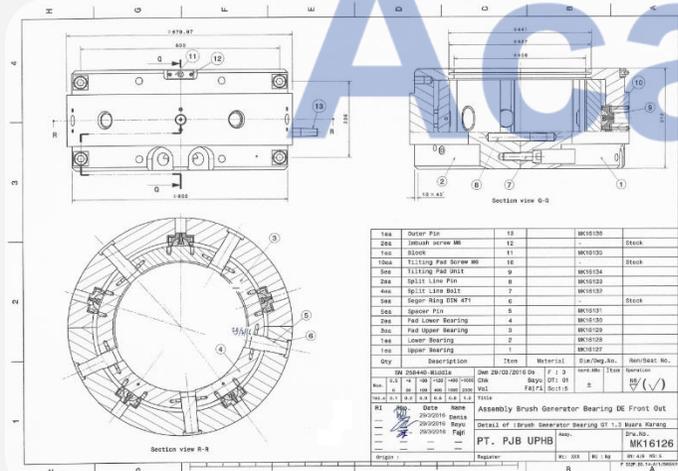
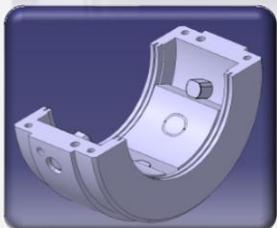
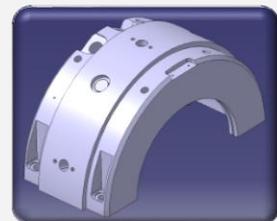
PMI - Chemical Composition Testing
Specification:
- Brand : HITACHI
- Type : PMI - MASTER SMART



Micro Hardness Testing
Specification:
- Brand : FUTURETECH
- Type : ARV 900

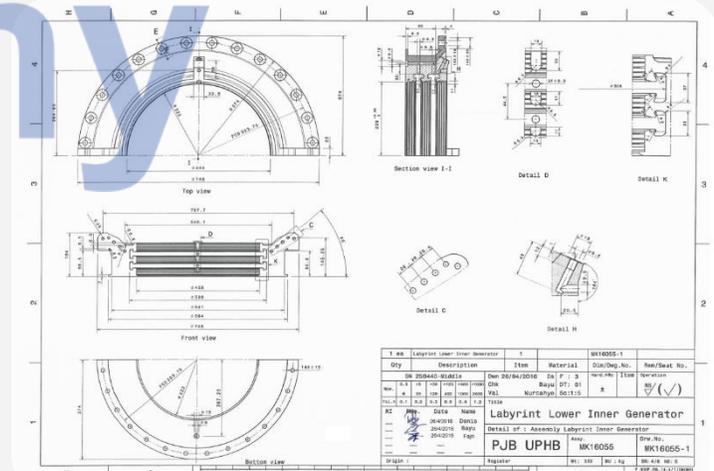
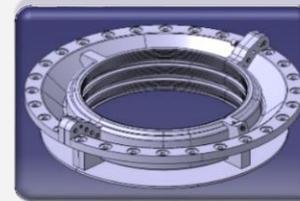
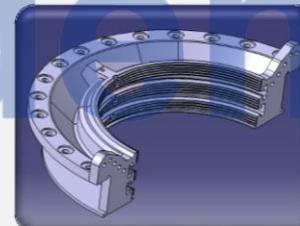
REVERSE ENGINEERING – IMPLEMENTASI

ASSY BRUSH GENERATOR BEARING DE – GT 1.3 MUARA KARANG



REVERSE ENGINEERING – IMPLEMENTASI

LABYRINTH LOWER INNER GENERATOR – GT 1.1 MUARA KARANG







CONTACT US

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Terima Kasih

