

Table 20. Assessment Result

SECTION	MODEL STOCK 1 (MATERIAL CODE)	MODEL STOCK 2 (MATERIAL CODE)	MODEL STOCK 3 (MATERIAL CODE)	MODEL STOCK 4 (MATERIAL CODE)
MECHANICAL	214	20	157	0
ELECTRICAL	45	0	0	0
INSTRUMENTATION	103	0	0	0
TOTAL	362	20	157	0

Overall, if we compare the total inventory, there is a reduction in the total inventory value across all sections, as shown at Figure 18, current amount inventory has 4.3 million USD, after conducting systematically review, the amount of inventory become 3.2 million USD.

Section	Current Amount Inventory	Systematic Approach Amount
Mechanical	3.7	2.7
Electrical	0.38	0.28
Instrumentation	0.20	0.19
Total	4.3	3.2

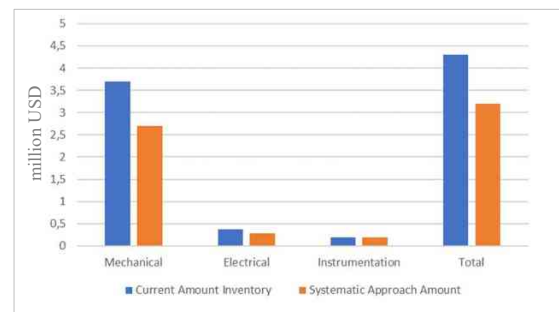


Figure 18. Overview overall before and after use of systematic approach

4.5.2 Sustainability of Improvement

In an effort to ensure that this assessment activity is carried out effectively and conducted regularly, standardization is required as a reference for the Company, including:

1. Establish Clear Spare Parts Management Policies
2. Regular Training and Skill Development on spare part management
3. Implement automated systems to minimize errors and ensure accurate record-keeping.
4. Regular Audits and Assessments

CHAPTER 5 – CONCLUSION AND RECOMMENDATION

5.1 Conclusion

Based on the results and analysis that have been conducted, answering the initial research question, the criteria needed in determining the criticality level of a spare parts component can be seen from *asset criticality, price or cost of spare parts, population of spare parts, lead time, stockout impact, supplier quantity, and failure probability*. Furthermore, examining into the specifics of these criteria provides a comprehensive understanding of their individual contributions to the determination of criticality. Collectively, these criteria offer a multi-dimensional framework for evaluating the criticality level of spare parts, providing a nuanced and comprehensive approach to inventory management decision-making.

Through this approach, it is expected that the company can be assisted in managing spare parts inventory, for which there has been no standardized guideline in determining MRO spare parts inventory. Upon comprehensive review, the results of the spare parts inventory decision-making using the multi-criteria decision method show a reduction in inventory by 25% compared to the current inventory, specifically for the Air Compressor unit.

Each company has different characteristics, but generally, this method can be implemented because it is quite simple and can be applied in daily practice, proving to be effective in reducing spare parts inventory. The simplicity of the method further enhances its applicability. A straightforward approach ensures that the method is not overly complex or burdensome in terms of understanding and implementation. This simplicity is advantageous for companies with varying levels of complexity and resources, making it accessible even to those without specialized expertise in inventory management

5.2 Recommendation

Recommendations and suggestions for future research:

1. For the company, the systematic method can be applied to other units.
2. For the next researcher, this research has not incorporated the minimum order factor from suppliers that must be followed by the buyer, so this variable can be added as an additional criterion in modelling, also this research has not taken into account the discount factor if purchases are made in bulk orders, so the quantity of spare parts needed may be affected. This could potentially be a factor contributing to the increase in inventory. This can be added as an additional criterion in modelling.
3. For the academics, it is anticipated that this writing contributes to the discourse on spare parts management, particularly concerning maintenance, repair, and overhaul.

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- 2020 – 2023 PT. Mitsubishi Chemical Indonesia, as Reliability Assistant Section Manager at Maintenance Department
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Training, Courses and Certification

- 2023 Awareness of Managing Ageing Plan (Remaining Life Assessment) held by Rexolindo
- 2023 Systematic Inventory Management Optimization (SIMO) by SKF
- 2021 Life Cycle Perspective Implementation Strategy in Environment Management System held by IIEA
- 2021 Internal Audit Sistem Manajemen Energi ISO 50001:2008 held by Synergy Solusi
- 2021 SKF IMx-16 & Observer
- 2021 Reliability & Maintenance Engineering - Failure Mode Effect Analysis (FMEA) - UDEMY
- 2019 – 2020 Experience Japan, an Intercultural Learning Program, Okayama & Tokyo – Japan
- 2019 Preparing for Migration from OHSAS 18001 to ISO 45001 & ISO 45001:2008 Internal Auditor
- 2018 – 2019 Japanese Language, Cilegon & Okayama – N5
- 2018 Awareness ISO 5001 EnMS & ISO 50000 series
- 2018 Metodologi New Kaizen bagi Fasilitator, held by PMMI
- 2017 The 7 Habits for Managers Workshop held by FranklinCovey
- 2016 ISO 14001:2015 Update Workshop Training Course held by Lloyd's Register LRQA
- 2016 Preparing for ISO 9001:2015 Workshop Training Course held by Lloyd's Register LRQA
- 2016 Se@vis Basic and Commissioning of SAACKE Burner, Bremen

	Germany
2016	Diklat Bina Mental, Disiplin dan Kepemimpinan held by KODIKLAT TNI AD
2016	MOC 10174 – Configuration and Administering Microsoft SharePoint 2010, 2016 held by INIXINDO Bandung
2015	MS Project Training, held by SMILE Group
2015	Project Management, held by MMS
2014	DCS Centum VP Maintenance Training, held by Yokogawa Indonesia
2014	DCS Centum VP Engineering Training, held by Yokogawa Indonesia
2013	7 Habits of Effective People, held by Dunamis
2012	Radiation Protection Officer Industrial Application II, held by National Nuclear Energy Agency - Jakarta
2012	Control Valve Selection Operation and Maintenance, held by FJM & ITB
2011	QCC PDCA TULTA, held by PMMI
2010	Modern Maintenance Management System, held by FJM
2010	Officer Development Program, held by MDI
2010	DCS Centum CS3000 Engineering Training, held by Yokogawa Indonesia
2010	Introduction & Internal Auditor of Integrated Management System held by MCCI
2008	Steel Processing Line, Maintenance Management, Isolating Procedure Training, held by BlueScope Steel Indonesia
2008	Training of Trainer, held by EXPO Mandiri
2005	Factory Automation Training, held by Sumitomo Rubber Industries Ltd Nagoya – Japan
2004	SCADA Ifix Intellution GE Training, held by Interpanca Kharisma Engineering
2001	Calibration Management System of ISO 9000:2000 and SNI 19-17025:2000, held by LIPI and INDOCAL
1999	PLC, HMI, Instrumentation, AC Servomotor Drive, held by Sumi Rubber Indonesia
1998	Web Design, Internet and Java, held by PUSTEKOM

APPENDICES

FAILURE MODE AND EFFECTS ANALYSIS

Main Unit : Air Compressor
 Sub Unit : Air Compressor Stage 1-5
 Core Team: Mr. B, Mr. C, Mr. D

Responsibility: Mr. A
 Prepared by: Mr. B

FMEA number: _____
 Page : _____
 FMEA Date _____ Rev: 0

Asset Criticality	Material Code	Section	Parts Category	Parts Description	Parts Function	Potential Failure Mode	Potential Effect(s) of Failure	Current Control	Assessment Results				
									S	O	D	RPN	S/P Criticality
A	110001001	MECHANICAL	Bearing	RADIAL TILTING PAD BEARING STAGE 3 BEARING NO.8, MATL: 000 010 753 142P/N: 65, GR. 5212-4-MP, CODE: 5212-90SERKO-1, MAKER: MAN	Support radial loads Allow for dynamic movement and misalignments Provide stability during operation	- Fracture or fatigue of tilting pads - Misalignment leading to uneven wear - wear and tear on the bearing surface - Insufficient lubrication causing friction and overheating	High Vibration, High Temperature Catastrophic	Interlock Control, Routine Inspection	10	6	5	300	HIGH
A	11000080	MECHANICAL	Bearing	RADIAL TILTING PAD BEARING STAGE 4 BEARING NO.7, MATL: 000 010 753 141P/N: 66, GR. 5212-4-MP, CODE: 5212-90SERKO-1, MAKER: MAN	Support radial loads Allow for dynamic movement and misalignments Provide stability during operation	- Fracture or fatigue of tilting pads - Misalignment leading to uneven wear - wear and tear on the bearing surface - Insufficient lubrication causing friction and overheating	High Vibration, High Temperature Catastrophic	Interlock Control, Routine Inspection	10	6	5	300	HIGH
A	10000570	MECHANICAL	Bearing	Trust bearing for bull gear shaft on motor side P/N 69 GR.5212-1Dwg.No:452	Support axial loads Ensure proper alignment of the bull gear shaft Facilitate smooth rotation of the shaft	- Fracture or fatigue of bearing components - Misalignment leading to uneven wear - wear and tear on bearing surfaces - Excessive axial movement	High Vibration, High Temperature Catastrophic	Interlock Control, Routine Inspection	8	5	5	200	MEDIUM
A	11000430	MECHANICAL	Bearing	THRUST BEARING GR-5212-POS-1-69 (FOR BULL GEAR SHAFT OR MOTOR SIDE) 4101	Support axial loads Ensure proper alignment of the bull gear shaft Facilitate smooth rotation of the shaft	- Fracture or fatigue of bearing components - Misalignment leading to uneven wear - wear and tear on bearing surfaces - Excessive axial movement	High Vibration, High Temperature Catastrophic	Interlock Control, Routine Inspection	8	5	5	200	MEDIUM
A	00800038	ELECTRIC	Socket	SOCKET CONTACT D-307330 - Order No: D-307030MAKER:SIEMENS	maintain electrical connections between components	Contact wear Poor contact pressure Corrosion	Increased electrical resistance, potential for overheating, and reduced reliability of the electrical connection. This may lead to intermittent or complete loss of electrical contact, affecting the performance of the connected components.	Visual Inspection	10	5	5	250	HIGH
A	11000050	MECHANICAL	Bearing	Journal brg. for turbine shaft of C-1711 On turbine side ; bearing no. 4Gr. no. 5 212-10 ; Sr. no. 71	Support the turbine shaft radially Facilitate smooth and stable rotation of the turbine shaft Distribute loads and prevent metal-to-metal contact	- Fracture or fatigue of bearing components - Misalignment leading to uneven wear - Wear and tear on bearing surfaces - Excessive radial movement - Shaft contact with the bearing due to a breakdown of the lubrication film	High Vibration, High Temperature Catastrophic	Interlock Control, Routine Inspection	8	5	5	200	MEDIUM
A	17702009	INSTRUMENT	MOV Parts	Auma Electric Actuator Type: SAR 14.1 - F14Power : 380V/50Hz/3P h Actuator Speed : 22/min	Electronic component for IGV Controller	Electronic failure	IGV Cant controlled	Inspection every 2 Y	10	6	5	300	HIGH
A	11001350	MECHANICAL	Bearing	BEARING PAD FOR SLIDE BEARING STAGE-3 PN. 5212-305MAKER: MAN TURBO	Support axial and radial loads in the air compressor Facilitate smooth sliding movement Distribute loads evenly to prevent metal-to-metal contact	-Fracture or fatigue of the bearing pad material - Wear and tear on the bearing surfaces - Misalignment leading to uneven wear - Excessive axial or radial movement	High Vibration, High Temperature Catastrophic	Interlock Control, Routine Inspection	10	6	5	300	HIGH
A	00100002	INSTRUMENT	Speed Sensor	Converter F/I speed sensor compressor D1553.10 U2 maker: Braun GMBH C)	Measure the speed or rotational velocity of a rotating component	-Sensor circuit failure - Connector corrosion or damage - Wiring issues leading to signal loss	Miss Indication--> Interlock	Periodical Inspection and Performance Test	10	5	5	250	HIGH
A	00800051	ELECTRIC	Electrodes	ELECTRODES R1 3/4, Z. 514-2206 (351206) 1 SET = 3 FIXES + 3 MOVABLE ELECTRODES	Facilitate the flow of electric current between the electrode and the workpiece or medium.	Wear and Erosion	Reduced conductivity and efficiency.	Visual Inspection	10	5	5	250	HIGH
A	84002001	INSTRUMENT	Vibration Module & Sensor	POWER SUPPLY P/N: 3500/15 LOW VOLTAGE AC (85 ~ 132 VAC)FOR NEW VIBRATION MONITORMARKER : BENTLY NEVADA	Provide stable and reliable electrical power to connected devices Maintain specified voltage and current levels Ensure continuous and safe operation of electronic equipment	- Voltage fluctuations or spikes - Current overload or short circuits - Component failure (e.g., capacitors, diodes) - Insufficient power output - Overheating of components - Inadequate heat dissipation	Power Supply Failure --> compressor Trip	Panel Cooler, Redundant Power Supply	10	7	8	560	HIGH
A	100001201	MECHANICAL	Seal	SHAFT SEAL 3rd STAGE, P/N: 16_GR.2261-2 MATL: 2452-9-014536/002.DWG: 452-0-0173 14, SERKO-2, MAKER: MAN	Sealed oil from Leakage to outside gearbox casing	Labyrinth damage (scratch, dent, wear)	Oil Leakage	Visual Inspection	8	5	5	200	MEDIUM

APPENDIX-1

FAILURE MODE AND EFFECTS ANALYSIS

Main Unit : Air Compressor
Sub Unit : Air Compressor Stage 1-5
Core Team: Mr. B, Mr. C, Mr. D

Responsibility: Mr. A
Prepared by: Mr. B

FMEA number:
Page :
FMEA Date : Rev: 0

Asset Criticality	Material Code	Section	Parts Category	Parts Description	Parts Function	Potential Failure Mode	Potential Effect(s) of Failure	Current Control	Assessment Results				
									S	O	D	RPN	S/P Criticality
A	17702010	INSTRUMENT	MOV Parts	Auma Control Matic Type: AM02.1 Power : 380V/50Hz/3Ph	Electronic component for IGV Controller	Electronic failure	IGV Cant controlled	Inspection every 2 Y	10	6	5	300	HIGH
A	78001003	INSTRUMENT	Vibration Module & Sensor	RADIAL SHAFT VIBRATION PROBE MODEL : 330105-02-12-05-02-003300 8MM ; LENGTH 0.5 MTRMAKER : BENTLY NEVADA	Measure radial shaft vibration in rotating machinery Provide feedback for monitoring and control systems Contribute to the prevention of machinery failure	- Fracture or damage to the probe structure - Misalignment leading to inaccurate readings - wear and tear on sensing elements - Excessive radial movement or pia	Compressor trip due miss indication	Periodical Inspection and Performance Test	10	7	8	560	HIGH
A	11200060	MECHANICAL	Bushing	BALANCE BUSH (PN.8) MATL : SN1300 GK-SIL70WAFOR SCREW SPINDLE PUMPDWG NO : 24276-4 BMAKER : MAN GHM	Provide support and balance for the screw spindle, ensuring smooth and efficient pump operation.	Wear and abrasion of the balance bush	Increased clearance between components, potential loss of alignment, reduced efficiency, and increased risk of further damage.	Visual Inspection	8	5	5	200	MEDIUM
A	78001002	INSTRUMENT	Vibration Module & Sensor	3300 XL PROXIMITOR MODEL : 330180-50-00LENGTH 5 MTR PANEL MOUNTMAKER : BENTLY NEVADA	Measure radial shaft vibration in rotating machinery Provide feedback for monitoring and control systems Contribute to the prevention of machinery failure	- Fracture or damage to the probe structure - Misalignment leading to inaccurate readings - wear and tear on sensing elements - Excessive radial movement or pia	Compressor trip due miss indication	Periodical Inspection and Performance Test	10	6	8	480	HIGH
A	11001520	MECHANICAL	Seal	SEALING RING WITH SPRING FOR SHAFT SEAL 5th STAGE, P/N: 27.GR.226 1-4, CODE: 2261-401,MATL:000 200 185 63 1, DWG:452-0-017314DOC: 10001121513, SER KO-1, MAKER: MAN	Sealed oil from Leakage to outside gearbox casing	Labyrinth damage (scratch, dent, wear)	Oil Leakage	Visual Inspection	10	6	5	300	HIGH
A	00100001	INSTRUMENT	Speed Sensor	PROGRAMABLE CONVERTER D421.21	Measure the speed or rotational velocity of a rotating component	- Sensor circuit failure - Connector corrosion or damage - Wiring issues leading to signal loss	Miss Indication--> Interlock	Periodical Inspection and Performance Test	10	5	5	250	HIGH
A	11200100	MECHANICAL	Coupling	COUPLING FOR MAIN OIL PUMP MATL: Z480-9-027095/009, POS: 7830-110D WG: 24276-4 B, MAKER: MAN	Connect and transmit power from the motor to the pump shaft.	Coupling fatigue or cracking	sudden failure of the coupling, resulting in the disconnection of the pump and motor.	Visual Inspection	8	5	5	200	MEDIUM
A	11001370	MECHANICAL	Seal	SEALING RING WITH SPRING FOR SHAFT SEAL 3rd STAGE, P/N: 16.GR.226 1-2, CODE: 2261-201,MATL:000 200 185 62 9, DWG:452-0-017314DOC: 10001121513, SER KO-1, MAKER: MAN	Sealed oil from Leakage to outside gearbox casing	Labyrinth damage (scratch, dent, wear)	Oil Leakage	Visual Inspection	6	5	5	150	LOW
A	11001450	MECHANICAL	Threaded Rod	THREADED ROD M10X55 LEFT AND RIGHT FOR IGV PN. 2170-17MAKER:MAN TURBO	To provide a means of mechanical attachment by screwing into a threaded hole.	Thread Deformation Corrosion	Reduced effectiveness in fastening, potential for failure.	Visual Inspection	6	5	5	150	LOW
A	11001510	MECHANICAL	Seal	SEALING RING WITH SPRING FOR SHAFT SEAL 4th STAGE, P/N: 17.GR.226 1-3, CODE: 2261-301,MATL:000 200 185 63 0, DWG:452-0-017314DOC: 10001121513, SER KO-1, MAKER: MAN	Sealed oil from Leakage to outside gearbox casing	Labyrinth damage (scratch, dent, wear)	Oil Leakage	Visual Inspection	10	6	5	300	HIGH
A	10000150	MECHANICAL	Seal	SEALING RING FOR SHAFT SEAL 3rd STAGE MATL: 000 200 185 629P/N: 16_GR.2261-2, DWG: 452-0-017314SERKO-2, MAKER: MAN	Sealed oil from Leakage to outside gearbox casing	Labyrinth damage (scratch, dent, wear)	Oil Leakage	Visual Inspection	10	6	5	300	HIGH
A	00800067	ELECTRIC	MOV Parts	POTENSIOMETER RW250(R1) 350974 POS 1	Electronic component for IGV Controller	Electronic failure	IGV Cant controlled	Inspection every 2 Y	10	5	5	250	HIGH
A	00800001	ELECTRIC	Brush Lifting Parts	DS-350978-07 BUSH STUD FOR BRUSH LIFTING DEVICE MAKER:SIEMENS	This compnent help The brushes of the slip rings help to connect both ends of the windings and connects with the three insulated slip rings. When an electrical machine is operated, the brushes start to lift up automatically.	Wear , Tear, damage	Motor failure : cant be started (not torque generate)	2Y and Per-motor Stop. Change Brush Holder/8Years	8	5	5	200	MEDIUM

APPENDIX-1

FAILURE MODE AND EFFECTS ANALYSIS

Main Unit : Air Compressor
 Sub Unit : Air Compressor Stage 1-5
 Core Team: Mr. B, Mr. C, Mr. D

Responsibility: Mr. A
 Prepared by: Mr. B

FMEA number: _____
 Page : _____
 FMEA Date Rev: 0

Asset Criticality	Material Code	Section	Parts Category	Parts Description	Parts Function	Potential Failure Mode	Potential Effect(s) of Failure	Current Control	Assessment Results				
									S	O	D	RPN	S/P Criticality
A	00800002	ELECTRIC	Brush Lifting Parts	DS-350978-08 FIXING ARRANGEMENT FOR BRUSH LIFTING DEVICE MAKER:SIEMENS	This compnent help The brushes of the slip rings help to connect both ends of the windings and connects with the three insulated slip rings. When an electrical machine is operated, the brushes start to lift up automatically.	Wear , Tear, damage	Motor failure : cant be started (not torque generate)	2Y and Per-motor Stop. Change Brush Holder/8Years	8	5	5	200	MEDIUM
A	00800003	ELECTRIC	Brush Lifting Parts	DS-350978-09 RATCHET WHEEL FOR BRUSH LIFTING DEVICE MAKER:SIEMENS	This compnent help The brushes of the slip rings help to connect both ends of the windings and connects with the three insulated slip rings. When an electrical machine is operated, the brushes start to lift up automatically.	Wear , Tear, damage	Motor failure : cant be started (not torque generate)	2Y and Per-motor Stop. Change Brush Holder/8Years	8	5	5	200	MEDIUM
A	00800004	ELECTRIC	Brush Lifting Parts	DS-350978-10 BRUSH W 25 MC79P FOR BRUSH LIFTING DEVICE MAKER:SIEMENS	This compnent help The brushes of the slip rings help to connect both ends of the windings and connects with the three insulated slip rings. When an electrical machine is operated, the brushes start to lift up automatically.	Wear , Tear, damage	Motor failure : cant be started (not torque generate)	2Y and Per-motor Stop. Change Brush Holder/8Years	8	5	5	200	MEDIUM
A	00800005	ELECTRIC	Brush Lifting Parts	DS-26210542 BRUSH HOLDER W25 (24 PIECES INCLUDED) MAKER:SIEMENS	This compnent help The brushes of the slip rings help to connect both ends of the windings and connects with the three insulated slip rings. When an electrical machine is operated, the brushes start to lift up automatically.	Wear , Tear, damage	Motor failure : cant be started (not torque generate)	2Y and Per-motor Stop. Change Brush Holder/8Years	8	5	5	200	MEDIUM
A	00800006	ELECTRIC	Brush Lifting Parts	DS-350978-12 BRACKET FOR BUSH LIFTING DEVICE MAKER:SIEMENS	This compnent help The brushes of the slip rings help to connect both ends of the windings and connects with the three insulated slip rings. When an electrical machine is operated, the brushes start to lift up automatically.	Wear , Tear, damage	Motor failure : cant be started (not torque generate)	2Y and Per-motor Stop. Change Brush Holder/8Years	8	5	5	200	MEDIUM
A	00800010	ELECTRIC	Brush Lifting Parts	DS-350978-17 SPLINT PIN 4 x 36 FOR BRUSH LIFTING DEVICEMAKER:SIEMENS C)	This compnent help The brushes of the slip rings help to connect both ends of the windings and connects with the three insulated slip rings. When an electrical machine is operated, the brushes start to lift up automatically.	Wear , Tear, damage	Motor failure : cant be started (not torque generate)	2Y and Per-motor Stop. Change Brush Holder/8Years	8	5	5	200	MEDIUM
A	00800013	ELECTRIC	Brush Lifting Parts	DS-350978-20 SPRING WASHER 12 DIN6796 FOR BRUSH LIFTING DEVICEMAKER:SIEMENS	This compnent help The brushes of the slip rings help to connect both ends of the windings and connects with the three insulated slip rings. When an electrical machine is operated, the brushes start to lift up automatically.	Wear , Tear, damage	Motor failure : cant be started (not torque generate)	2Y and Per-motor Stop. Change Brush Holder/8Years	8	5	5	200	MEDIUM
A	00800015	ELECTRIC	Bolt	DS-350978-22 HEXAGON BOLT M20 x 50mmL ISO 4017 FOR BRUSH LIFTING DEVICEMAKER:SIEMENS	This compnent help The brushes of the slip rings help to connect both ends of the windings and connects with the three insulated slip rings. When an electrical machine is operated, the brushes start to lift up automatically.	Wear , Tear, damage	Motor failure : cant be started (not torque generate)	2Y and Per-motor Stop. Change Brush Holder/8Years	8	5	5	200	MEDIUM
A	00800016	ELECTRIC	Brush Lifting Parts	DS-350978-23 SPRING WASHER 20 DIN6796 FOR BRUSH LIFTING DEVICEMAKER:SIEMENS	This compnent help The brushes of the slip rings help to connect both ends of the windings and connects with the three insulated slip rings. When an electrical machine is operated, the brushes start to lift up automatically.	Wear , Tear, damage	Motor failure : cant be started (not torque generate)	2Y and Per-motor Stop. Change Brush Holder/8Years	8	5	5	200	MEDIUM
A	00800023	ELECTRIC	Brush Lifting Parts	HINGE BAR HEAD TYPE SF 10 ; (Part-30) DS-350978-30 ; Order No: 65086098FOR BRUSH LIFTING DEVICEMAKER:SIEMENS	This compnent help The brushes of the slip rings help to connect both ends of the windings and connects with the three insulated slip rings. When an electrical machine is operated, the brushes start to lift up automatically.	Wear , Tear, damage	Motor failure : cant be started (not torque generate)	2Y and Per-motor Stop. Change Brush Holder/8Years	8	5	5	200	MEDIUM

APPENDIX-2

MCDM RESULT

Main Unit : Air Compressor
 Sub Unit : Air Compressor Stage 1-5
 Core Team Mr. B, Mr. C, Mr. D

MCDM number: 1
 Page : 1 of 1
 MCDM Date 17/11/2023 Rev:

Material Code	S/P Criticality	Lead Time	Lead Time Rank	S/P Unit Price	Price Rank	Model Stock	Decision	Proposal Quantity	Remark
110001001	HIGH	18	HIGH	56580,35	HIGH	Model 1	Stock	1	
11000080	HIGH	18	HIGH	56580,35	HIGH	Model 1	Stock	1	
11001350	HIGH	6	HIGH	10313,4	HIGH	Model 1	Stock	1	
11001520	HIGH	12	HIGH	597,61	LOW	Model 1	Stock	1	
11001510	HIGH	12	HIGH	571,17	LOW	Model 1	Stock	1	
10000150	HIGH	12	HIGH	566,1	LOW	Model 1	Stock	1	
10000240	HIGH	12	HIGH	244,45	LOW	Model 1	Stock	1	
100000801	HIGH	18	HIGH	2,07	LOW	Model 1	Stock	1	
100000901	HIGH	18	HIGH	4,45	LOW	Model 1	Stock	1	
10000130	HIGH	10	HIGH	86,33	LOW	Model 1	Stock	1	
10000140	HIGH	8	HIGH	58,09	LOW	Model 1	Stock	2	
11001390	HIGH	6	HIGH	30,65	LOW	Model 1	Stock	2	
10000170	HIGH	12	HIGH	541,55	LOW	Model 1	Stock	1	
10000180	HIGH	7	HIGH	73,85	LOW	Model 1	Stock	1	
10000190	HIGH	8	HIGH	97,26	LOW	Model 1	Stock	1	
10000250	HIGH	12	HIGH	6,09	LOW	Model 1	Stock	1	
10000280	HIGH	12	HIGH	9122,08	HIGH	Model 1	Stock	1	
10000290	HIGH	12	HIGH	686,58	LOW	Model 1	Stock	1	
10000330	HIGH	12	HIGH	753,42	LOW	Model 1	Stock	1	
10000360	HIGH	5	HIGH	122,16	LOW	Model 1	Stock	1	
10000370	HIGH	5	HIGH	383,24	LOW	Model 1	Stock	1	
10000530	HIGH	18	HIGH	41996,95	HIGH	Model 1	Stock	1	
10000540	HIGH	18	HIGH	41624,51	HIGH	Model 1	Stock	1	

APPENDIX-3

AHP

Matrix Comparison

Maintenance	9	7	5	3	1	3	5	7	9	Logistic
				1						

Kriteria	Maintenan	Logistic	Eigen Value	Sum	Average
Maintenance	1	2	0,666667	0,666667	1,333333
Logistic	0,500	1	0,333333	0,333333	0,666667
Jumlah	1,500	3,000			

Consistency Index (CI) = Lambda Max -n / (n-1)

Lambda Max	2
CI	0
CR=CI/IR	0

Asset Criticality	9	7	5	3	1	3	5	7	9	Population
			1							
Asset Criticality	9	7	5	3	1	3	5	7	9	Failure Probability
		1								
Population	9	7	5	3	1	3	5	7	9	Failure Probability
				1						

Kriteria	Asset Critik	Population	Failure Probability	Eigen Value	Sum	Average
Asset Criticality	1	5	7,000	0,744681	0,789474	0,636364
Population	0,200	1	3,000	0,148936	0,157895	0,272727
Failure Probability	0,143	0,333	1,000	0,106383	0,052632	0,090909
Jumlah	1,343	6,333	11,000			

Consistency Index (CI) = Lambda Max -n / (n-1)

Lambda Max	3,111464
CI	0,055732
CR=CI/IR	0,096089

Price	9	7	5	3	1	3	5	7	9	Lead Time
				1						
Price	9	7	5	3	1	3	5	7	9	Suplier Number
		1								
Lead Time	9	7	5	3	1	3	5	7	9	Suplier Number
				1						

Kriteria	Price	Lead Time	Suplier Number	Eigen Value	Sum	Average
Price	1	3	7,000	0,677419	0,714286	0,538462
Lead Time	0,333	1	5,000	0,225806	0,238095	0,384615
Suplier Number	0,143	0,200	1,000	0,096774	0,047619	0,076923
Jumlah	1,476	4,200	13,000			

Consistency Index (CI) = Lambda Max -n / (n-1)

Lambda Max	3,096726
CI	0,048363
CR=CI/IR	0,083384

APPENDIX- 4

Model Stock- 1

NO.	SKU Number	Model Stock	Unit Price (USD)	Population	Population Factor	Repair Cost (K)	Lead Time (Days)	Loss Impact (KUSD)	Total Loss (KUSD)	ROI	Decision	Qty
4	110001001	Model 1	56580	2	0,5	10	540	5400	67	0,01	STOCK	1
5	11000080	Model 1	56580	2	0,5	10	540	5400	67	0,01	STOCK	1
6	10000570	Model 1	49775	2	0,5	10	540	5400	60	0,01	STOCK	1
7	11000430	Model 1	36508	2	0,5	10	540	5400	47	0,01	STOCK	1
8	00800063	Model 1	33953	2	0,5	1	240	2400	35	0,01	STOCK	1
9	00800038	Model 1	4316	24	0,125	1	240	2400	5	0,00	STOCK	3
10	11000050	Model 1	16581	2	0,5	10	540	5400	27	0,00	STOCK	1
11	17702009	Model 1	11050	2	0,5	1	180	1800	12	0,01	STOCK	1
12	11001350	Model 1	10313	2	0,5	10	180	1800	20	0,01	STOCK	1
14	00100002	Model 1	7000	2	0,5	1	120	1200	8	0,01	STOCK	1
15	00800051	Model 1	5629	2	0,5	1	240	2400	7	0,00	STOCK	1
16	84002001	Model 1	2731	4	0,25	1	240	2400	4	0,00	STOCK	1
17	100001201	Model 1	4945	2	0,5	10	540	5400	15	0,00	STOCK	1
18	17702010	Model 1	4024	2	0,5	1	180	1800	5	0,00	STOCK	1
20	78001003	Model 1	914	8	0,25	1	180	1800	2	0,00	STOCK	2
21	11200060	Model 1	1777	2	0,5	10	300	3000	12	0,00	STOCK	1
22	78001002	Model 1	1068	24	0,125	1	180	1800	2	0,00	STOCK	3
23	11001520	Model 1	598	2	0,5	10	360	3600	11	0,00	STOCK	1
24	00100001	Model 1	2542	2	0,5	1	120	1200	4	0,00	STOCK	1
25	11200100	Model 1	2516	2	0,5	10	300	3000	13	0,00	STOCK	1
28	11001510	Model 1	571	2	0,5	10	360	3600	11	0,00	STOCK	1
29	10000150	Model 1	566	2	0,5	10	360	3600	11	0,00	STOCK	1
30	00800067	Model 1	1077	2	0,5	1	240	2400	2	0,00	STOCK	1
32	00800001	Model 1	2045	2	0,5	1	240	2400	3	0,00	STOCK	1
33	00800002	Model 1	506	2	0,5	1	240	2400	2	0,00	STOCK	1
34	00800003	Model 1	2534	2	0,5	1	240	2400	4	0,00	STOCK	1
35	00800004	Model 1	154	24	0,125	1	240	2400	1	0,00	STOCK	3
36	00800005	Model 1	792	24	0,125	1	240	2400	2	0,00	STOCK	3
37	00800006	Model 1	386	2	0,5	1	240	2400	1	0,00	STOCK	1
38	00800010	Model 1	12	2	0,5	1	240	2400	1	0,00	STOCK	1
39	00800013	Model 1	7	2	0,5	1	240	2400	1	0,00	STOCK	1
40	00800015	Model 1	22	2	0,5	1	240	2400	1	0,00	STOCK	1
41	00800016	Model 1	9	2	0,5	1	240	2400	1	0,00	STOCK	1
42	00800023	Model 1	223	2	0,5	1	240	2400	1	0,00	STOCK	1
43	00800025	Model 1	188	2	0,5	1	240	2400	1	0,00	STOCK	1
44	00800026	Model 1	183	2	0,5	1	240	2400	1	0,00	STOCK	1
45	00800027	Model 1	270	2	0,5	1	240	2400	1	0,00	STOCK	1
46	00800032	Model 1	266	2	0,5	1	240	2400	1	0,00	STOCK	1
47	00800035	Model 1	11	2	0,5	1	240	2400	1	0,00	STOCK	1
48	00800036	Model 1	385	2	0,5	1	240	2400	1	0,00	STOCK	1
49	00800037	Model 1	35280	2	0,5	1	240	2400	36	0,02	STOCK	1
50	00800039	Model 1	264	16	0,125	1	240	2400	1	0,00	STOCK	2
51	00800052	Model 1	1388	2	0,5	1	240	2400	2	0,00	STOCK	1
52	00800053	Model 1	8	2	0,5	1	240	2400	1	0,00	STOCK	1
53	00800054	Model 1	33	2	0,5	1	240	2400	1	0,00	STOCK	1
54	00800055	Model 1	56	2	0,5	1	240	2400	1	0,00	STOCK	1
55	00800074	Model 1	86404	2	0,5	1	240	2400	87	0,04	STOCK	1
56	00800075	Model 1	81033	2	0,5	1	240	2400	82	0,03	STOCK	1
57	80010016	Model 1	1878	24	0,125	1	240	2400	3	0,00	STOCK	3
58	80010010	Model 1	761	24	0,125	1	240	2400	2	0,00	STOCK	3
59	80010004	Model 1	1701	24	0,125	1	240	2400	3	0,00	STOCK	3
60	80010030	Model 1	737	6	0,25	1	180	1800	2	0,00	STOCK	2
61	00800065	Model 1	231	2	0,5	1	240	2400	1	0,00	STOCK	1

APPENDIX- 4 Model Stock-2

NO.	SKU Number	Model Stock	Unit Price (USD)	Population	Population Factor	Monthly Consum	Safety Stock	Qty
215	20000120	Model 2	103	2	0,5	0,1	1	1
457	12000020	Model 2	92	2	0,5	0,1	1	1
458	12000030	Model 2	107	2	0,5	0,1	1	1
459	12000040	Model 2	100	4	0,25	0,2	2	2
478	18000060	Model 2	1292	2	0,5	0,0	1	1
497	11200020	Model 2	2	8	0,125	0,1	4	1
499	11200010	Model 2	21	8	0,125	0,1	4	1
500	33000096	Model 2	7	12	0,125	0,3	6	2
501	81200020	Model 2	32	4	0,25	0,1	2	1
505	81200310	Model 2	1	4	0,25	0,0	2	1
506	11200180	Model 2	88	8	0,125	0,4	4	2
507	80000001	Model 2	40	4	0,25	0,0	2	1
508	81200180	Model 2	376	2	0,5	0,0	1	1
512	10000030	Model 2	48	4	0,25	0,2	2	2
524	11000110	Model 2	3487	4	0,25	0,0	2	1
525	12000100	Model 2	1146	2	0,5	0,0	1	1
527	13000010	Model 2	52	2	0,5	0,1	1	1
528	13000020	Model 2	66	2	0,5	0,1	1	1
529	13000030	Model 2	53	2	0,5	0,1	1	1
530	13000040	Model 2	59	4	0,25	0,2	2	2

APPENDIX- 4

Model Stock-3

NO.	SKU Number	Model Stock	Unit Price (USD)	Annual Usage	Monthly Consum	Order Cost	Carrying Cost	Min	Max	ROP	EOQ
141	13000270	Model 3	123	0,7	0,1	390	1	17	41	17	24
219	20000250	Model 3	78	0,1	0,0	390	1	1	12	1	11
220	20000290	Model 3	5	0,1	0,0	390	1	4	11	4	7
223	30000010	Model 3	42	0,3	0,0	390	1	4	19	4	15
367	12000060	Model 3	48559	0,1	0,0	390	1	1	9	1	7
368	120000701	Model 3	48559	0,1	0,0	390	1	1	9	1	7
378	12000200	Model 3	5091	0,1	0,0	390	1	1	9	1	7
379	12000210	Model 3	7738	0,0	0,0	390	1	2	2	2	0
380	12000220	Model 3	8369	0,1	0,0	390	1	2	10	2	7
381	12000230	Model 3	25155	0,1	0,0	390	1	1	9	1	7
382	12000240	Model 3	31498	0,1	0,0	390	1	1	12	1	11
383	12000260	Model 3	1	0,0	0,0	390	1	2	2	2	0
384	12000410	Model 3	183	0,0	0,0	390	1	16	16	16	0
385	12000420	Model 3	967	0,0	0,0	390	1	1	1	1	0
386	12000430	Model 3	727	0,0	0,0	390	1	1	1	1	0
387	12000440	Model 3	8	0,0	0,0	390	1	8	8	8	0
388	12000450	Model 3	31	0,0	0,0	390	1	8	8	8	0
397	130000901	Model 3	182	0,4	0,0	390	1	19	35	19	17
398	130001001	Model 3	1	0,0	0,0	390	1	2	2	2	0
400	13000120	Model 3	18977	0,2	0,0	390	1	1	14	1	13
401	13000130	Model 3	16888	0,3	0,0	390	1	1	16	1	15
402	13000140	Model 3	25976	0,0	0,0	390	1	2	2	2	0
403	13000150	Model 3	18	0,0	0,0	390	1	2	2	2	0
404	130001601	Model 3	18	0,0	0,0	390	1	2	2	2	0
405	13000170	Model 3	10	0,0	0,0	390	1	2	2	2	0
406	13000180	Model 3	10	0,0	0,0	390	1	2	2	2	0
407	13000190	Model 3	10	0,0	0,0	390	1	2	2	2	0
408	13000210	Model 3	4	0,0	0,0	390	1	10	10	10	0
409	13000220	Model 3	488	0,1	0,0	390	1	1	9	1	7
410	13000240	Model 3	1108	0,0	0,0	390	1	5	5	5	0
411	13000250	Model 3	794	0,0	0,0	390	1	5	5	5	0
412	13000260	Model 3	22059	0,0	0,0	390	1	1	1	1	0
413	13000280	Model 3	801	0,0	0,0	390	1	1	1	1	0
414	13000300	Model 3	7	0,0	0,0	390	1	8	8	8	0
415	13000310	Model 3	14	0,0	0,0	390	1	8	8	8	0

APPENDIX-5

Cut Off Method

Weighted	Price/Cost	Lead Time	Demand/Usage	Population	Failure Proba	Jumlah Supplier	Repair time	stockout impac	quantity stock	failure mode	maintenance poli	aset critica	residual ris	employee qualificatio
Mr.A	3	2	3	3	1	3	1	3	2	1	1	3	1	1
Mr.B	3	3	2	3	3	3	2	3	2	2	2	3	2	1
Mr.C	3	3	2	3	2	3	3	3	2	2	2	3	2	2
Mr.D	3	3	3	3	2	3	3	3	3	3	3	3	2	2
Mr.E	3	3	2	3	3	3	2	2	2	2	2	3	2	3
Mr.F	3	3	2	3	3	3	1	2	3	2	1	3	3	2
Mr.G	3	2	2	3	2	2	2	2	1	2	2	3	2	2
Mr.H	3	3	2	3	3	2	2	3	2	2	2	3	2	2
Mr.I	3	3	1	2	3	2	2	3	1	3	3	2	3	2
Mr.J	2	3	3	2	2	3	2	3	2	2	2	3	2	2
Average	2,9	2,8	2,2	2,8	2,4	2,7	2	2,7	2	2,1	2	2,9	2,1	1,9

	Not Important	Somehow	Very Important	average
Employee qualifica	2	7	1	1,9
Repair time	2	6	2	2
Quantity stock	2	6	2	2
Maintenance policy	2	6	2	2
Failure mode	1	7	2	2,1
Residual risk	1	7	2	2,1
Demand/Usage	1	6	3	2,2
Failure Probability	1	4	5	2,4
Supplier Quantity	0	3	7	2,7
Stockout impact	0	3	7	2,7
Lead Time	0	2	8	2,8
Population	0	2	8	2,8
Price/Cost	0	1	9	2,9
Asset criticality	0	1	9	2,9

Mean 2,4