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Designing Standard Operating Procedure (SOP) For Planning and Implementing Machine Maintenance for The Implementation of ISO 9001:2015 Clause 7.1.3 Using the Business Process Management (BPM) Method in Hijab Printing Production

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ABSTRACT

Maintenance management is important for production companies that rely on machines as the main infrastructure. UMKM Meflanna, as a printed hijab producer, has not managed machine maintenance routinely and effectively, which impacts the cessation of the production process and the failure to achieve several production targets. This study aims to compile a Standard Operating Procedure (SOP) for planning and implementing machine maintenance using the Business Process Management (BPM) method. The BPI method supports business process improvement by analysing the gap between actual conditions and the requirements of ISO 9001:2015 clause 7.1.3, which is the basis for designing process improvements. This study produces an SOP for Machine Maintenance Planning and Implementation, which includes preventive maintenance planning procedures and corrective and preventive maintenance implementation. It also provides supporting forms to document maintenance information. With structured procedures and better documentation, UMKM Meflanna is expected to maintain production continuity and achieve the set targets.

Keywords: *Business Process Management (BPM), ISO 9001:2015 clause 7.1.3, maintenance management, Standard Operating Procedure (SOP)*

Introduction

UMKM Printing Meflanna is one of the hijab printing businesses that was established in 2019 during the COVID-19 pandemic and is located in Soreang District, Bandung Regency. Meflanna is a company that produces printed hijabs as its main product. The materials used in making the hijab consist of several types of materials, namely premium voal, tryspan voal, supersoft voal, and supervine voal. In addition, Meflanna also produces other Muslim clothing products such as gamis clothes, prayer rugs, and travel mukena. The production strategy implemented by this UMKM is make-to-order, where the company will produce products according to customer specifications and requests.

Meflanna has several processes for running its business, especially in hijab production. Starting from the process of procuring raw materials from suppliers, the production process, and the packaging process until the customer receives it in a finished product that has been packaged. The hijab printing production process at Meflanna goes through several stages. Namely, the design process uses a computer, the printing process uses a printing machine and paper roll to print the design results, and the pressing process uses a press machine. Next is the laser-cut process using a laser machine and the quality control and packaging processes. The following is the flow process for making printed hijabs at Meflanna.

The stages of the production process in printed hijab UMKMs that use machines to support production must implement clear rules and processes and a Quality Management System (QMS). If you do not implement QMS, many risks will occur in the product production process, such as production targets that are not achieved and reducing customer satisfaction with the company. In this UMKM, several obstacles cause production results not to meet the desired target. The following is a production graph in 2023.

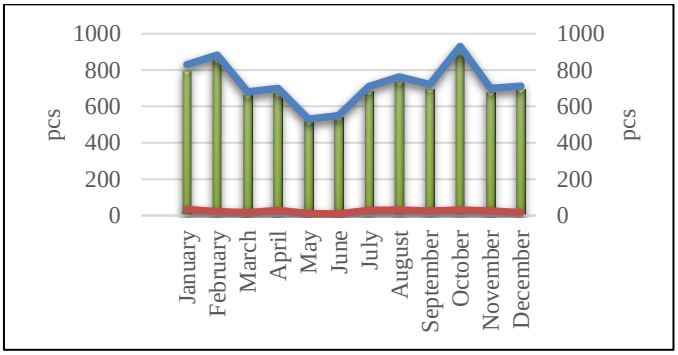


Figure 1 2023 production target graph

The graph above shows a difference between monthly production results and the desired target. The percentage of failed production products is above 2% each month, exceeding the tolerance limit set by the company. Based on observations at the production house, some possible obstacles are delays in delivering raw materials, technical problems with the machine, and a lack of skilled workers who can operate the equipment efficiently.

The lack of maintenance management on the machine causes various problems in the company, including obstacles that often occur during the hijab printing production process. Therefore, it is necessary to make improvements as appropriate. This is according to the quality management standard, namely ISO 9001: 2015 clause 7.1.3, which states that organisations must determine and maintain the inventory needed in the operating process and achieve product conformity with customer demand. This hijab printing UMKM has not been consistent with routine machine maintenance because maintenance occurs when the machine's performance is no longer optimal.

In its operations, UMKM Meflanna has not performed routine maintenance on damaged machines; it only repairs when there are obstacles or damage, which operators or technicians handle as needed. Therefore, a procedure is needed to plan and implement routine and regular machine maintenance. Implementing routine and scheduled machine maintenance can be adjusted to the requirements of ISO 9001:2015 clause 7.1.3. This is expected to help MSMEs ensure the availability of necessary resources and improve machine reliability so that the production process can run more efficiently and reduce the risk of production disruption. Based on the problems and risks above, the following is described in more detail as a fishbone diagram.

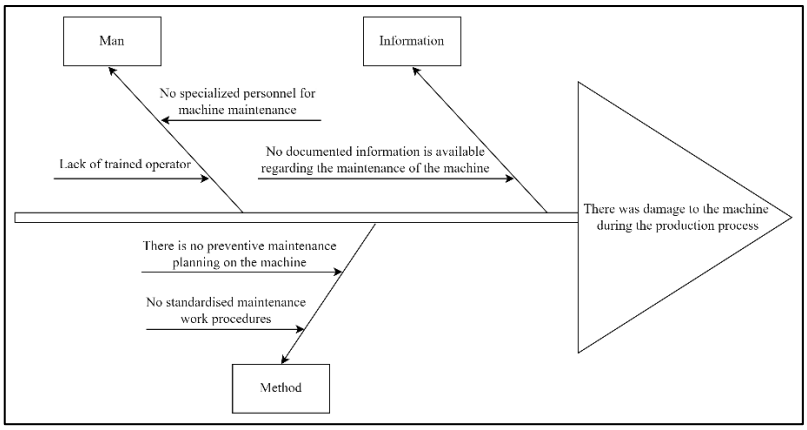


Figure 2 Fishbone Diagram

In Figure I.4 above, several root problems are identified as the main factors, namely the failure of the machine, which hinders the production process. Three factors influence this: method, information, and man. The first factor is the method, which is caused by the lack of preventive maintenance planning on the machine, and MSMEs have not made maintenance work procedures by the standards. The second factor is information caused by the lack of documented information about machine maintenance. The last factor is the man, which is the cause of the operator being poorly trained and there being no special workers for the engine maintenance section.

Based on the problems in the fishbone diagram, MSMEs need to implement clear rules in the form of SOPs (Standard Operating Procedures) to meet the requirements needed in planning and implementing machine maintenance. The design of this SOP is carried out so that machine maintenance

is carried out regularly and regularly. With the SOP for this inventory maintenance process, especially the machines used for the production process, it will make it easier for workers and companies in terms of maintenance and machine maintenance to run more systematically based on the standards that have been set. The creation of SOPs will later consider the requirements of ISO 9001:2015 clause 7.1.3 and the theory of maintenance management or maintenance itself. In this study, the author will use the maintenance management theory according to Corder (1996). This research will design the proposal using the Business Process Management (BPM) method. The BPM life cycle method was also applied in preparing SOPs in the warehouse rental service industry, as studied by [1], [2], [3], [4], [5], thus making the process more effective and efficient.

This study contributes significantly to the literature on BPM and maintenance management by demonstrating its application in resource-constrained MSMEs. Through this study, it was identified that implementing BPM is not only effective for large companies but is also highly relevant to maximise operational efficiency in MSMEs. For example, in this study, using BPM to schedule preventive maintenance of a hijab printing machine enabled the company to increase machine uptime while reducing unexpected repair costs. This innovation included the development of an adaptive maintenance model that could be implemented with limited resources, offering a framework that other MSMEs in similar industries could replicate to achieve productivity and efficiency improvements. Furthermore, the findings suggest that MSMEs can adopt simple information technology to integrate BPM principles into their daily operations, paving the way for continuous improvement without requiring large investments[6], [7], [8], [9], [10].

ISO 9001:2015

ISO 9001:2015 is a quality management standard issued by the International Organization for Standardization (ISO), which contains the requirements that a company or organisation must meet in the form of a quality management system.

ISO 9001:2015 Requirements

ISO 9001:2015 covers many things that companies must know and fulfil to achieve certification, which is a requirement. Related to these requirements in ISO, a term clause or clause contains rules used as references in carrying out ISO 9001:2015 certification. In the ISO 9001:2015 guide, 10 clauses need to be understood.

1. Scope or Scope.
2. Normative Reference or Normative Reference.
3. Terms and References or Terms and Definitions.
4. Context of Organization or Organizational Context.
5. Leadership or Leadership.
6. Planning or Planning.
7. Support or Support.
8. Operation or Operational.
9. Performance Evaluation or Performance Evaluation.
10. Improvement or Performance Improvement

Standard Operating Procedure (SOP)

A Standard Operating Procedure (SOP) is a system designed to facilitate and organise work[11]. The objectives and functions of SOP are as follows.
1. Provide a practical record of activities and operations.
2. Establish discipline in all organisation members, both in the organisation and the company.
3. Maintain a consistent level of performance in each work unit.
4. Minimize errors or failures, doubts or duplications, and inefficiencies.
5. Help strengthen company regulations, etc.

Maintenance

Maintenance is an important function in a manufacturing company, as is production. Maintenance is required to ensure that equipment and production continue to function. It includes routine checks, lubrication, damage repair, and adjustment or replacement of spare parts. Maintenance work keeps the factory functioning and products delivered to customers on time. It aims to keep the factory running efficiently with minimal disruption.
Maintenance is a concept of all work that aims to keep machines or facilities in good condition as before by maintaining and preserving their quality[12]

Maintenance Management

Maintenance management, in general, is an activity related to planning, organisation, staffing, program implementation, and control methods of maintenance activities. This activity aims to optimise maintenance performance by increasing the reliability and availability of a system or equipment through good planning, organisation, workforce management, supervision, and evaluation. The steps that must be taken in maintenance activities are as follows.

a. Determine what infrastructure will be maintained
b. Design and determine how the maintenance schedule for the specified infrastructure is
c. Carry out preventive and corrective infrastructure maintenance
d. Creating job criteria that include a schedule and specifications during maintenance, e. Creating a history in the form of maintenance records carried out
f. Conducting evaluations and inspections after maintenance has been carried out

Business Process Management (BPM)

Business Process Management is an organised management method to improve quality and service through identification, design, modelling, documentation, control, and improvement of business processes to achieve certain results in an organisation [13], [14], [15]

Business Process Management Lifecycle

There are six business process management lifecycles, namely [16]

1. Process Identification
2. Process Discovery
3. Process Analysis
4. Process Redesign
5. Process Implementation
6. Process Monitoring and Controlling

Risk Definition

The Institute of Risk Management (IRM) defines risk as a combination of the possibility of an event and its consequences, which can be positive or negative. This definition is broad, practical, and easy to apply. Meanwhile, the international guide for the definition of risk, namely ISO Guide 73, defines risk as "the effect of uncertainty on an objective", which may be positive, negative, or different from what is expected. Risk is often described in the form of events, changes in circumstances, or results [17], [18], [19], [20]

Key Performance Indicator

KPI is a portrait that quantitatively identifies the performance of the execution of an organisation's strategic vision that produces a concrete database. KPI characteristics are aligned with the organisation's strategic vision, well understood, open to monitoring and evaluation, and contextual [21], [22]

Mean Time to Repair

Mean Time to Repair, or MTTR, is the time required to recover a system from a failure. This also includes the time needed to diagnose the problem, the time needed to get a technician, and the time needed to repair the system. MTTR indicates the availability value and not reliability [23], [24], [25], [26]

Research Methods

The method used in this study is Business Process Management (BPM) with the ISO 9001:2015 clause 7.1.3 approach and maintenance management theory. BPM is a systematic methodology that can help companies improve their performance by redesigning processes. The ISO 9001:2015 approach and maintenance management theory can help prepare SOPs. This study has several stages, namely the data collection stage, data processing stage, design stage, verification and validation stage, and design results analysis stage.

The first stage of data collection begins with the initial phase in the BPM life cycle, namely process identification. At this stage, the necessary primary and secondary data are collected. Furthermore, the second stage is carried out: data processing with levelling processes on the main business process (process discovery). The third stage is process analysis, which analyses the gap between existing conditions, ISO 9001:2015 requirements, and maintenance management theory.

Furthermore, the fourth phase of the BPM life cycle is carried out at the design stage, namely process redesign. Process redesign is done by designing a process model framework, identifying the proposed PDCA cycle, and designing a proposed business process consisting of a preventive maintenance planning business process and a corrective and preventive machine maintenance

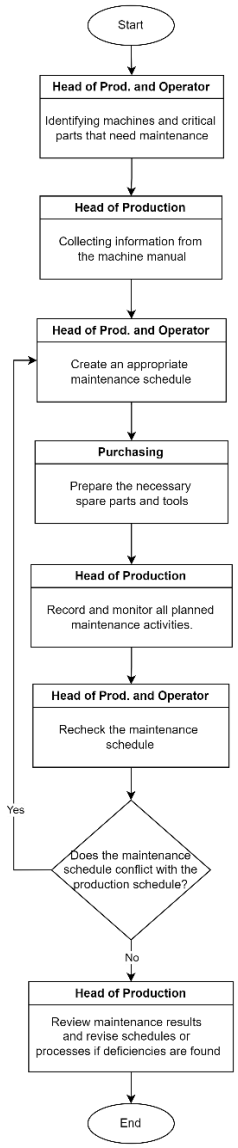
implementation business process. Next, the SOP for planning and implementing machine maintenance will be designed.

Results and Discussion

Preventive Maintenance Planning SOP

The preventive machine maintenance planning SOP is designed as a guide for MSMEs to ensure that machine maintenance planning is carried out properly and on schedule. With this SOP, the maintenance planning process can run more effectively and structure, helping companies maintain long-term machine reliability and minimise production disruptions risk.

Table 1 . Preventive Maintenance Planning Business Process

SOP for Preventive Machine Maintenance Planning		
Flow Process	**Process Description**	**Supporting Documents**
	1. The Production Manager and Operators identify critical machines and components that require preventive maintenance.	1. Form for listing critical machines and components (spare parts)
	2. The Production Head collects and studies the maintenance manuals from the manufacturer for each machine.	2. Manufacturer's maintenance guide
	3. The Production Head and Operator prepare a preventive maintenance schedule that is adjusted to the production schedule. They arrange maintenance time by considering machine operating hours and the production schedule.	3. Preventive maintenance schedule form
	4a. Purchasing identifies and procures spare parts and tools required for maintenance. 4b. Prepares a budget for maintenance-related costs.	4a. List of spare parts and tools 4b. Maintenance budget
	5. The Production Head organises a recording system to document maintenance schedules and history.	5. Monitoring form
	6a. Production Head and Operator coordinate to ensure maintenance does not disrupt the production schedule. 6b. Adjust the maintenance schedule if there is a change in production.	
	7. The Production Head reviews the effectiveness of the maintenance schedule and adjusts it, if necessary, based on the evaluation results.	7. Maintenance plan evaluation form

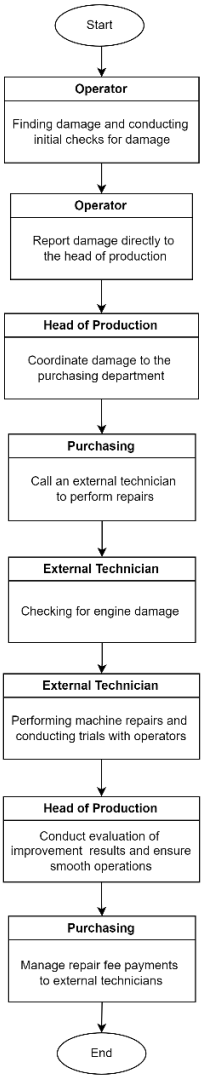
The image's SOP for Preventive Machine Maintenance Planning shows the process flow that starts from identifying maintenance needs by the Production Head and Operator based on the schedule or results of previous inspections. After that, the Production Head reviews the condition of the machine to determine whether maintenance is necessary and then determines the schedule and resources needed. If spare parts are needed, the Purchasing team will purchase them after checking availability. Next, maintenance is scheduled by considering whether the schedule clashes with production. If there is a clash, the schedule is adjusted; if not, the process continues. Maintenance is carried out by the Production Head

and Operator and documented in supporting documents such as machine inspection forms, purchase orders, and maintenance reports. This flow ensures that maintenance is carried out on time and in a structured manner, with the flexibility to adjust the maintenance schedule not to disrupt production.

Corrective Maintenance Implementation SOP

The corrective machine maintenance SOP is useful as a reference for MSMEs in repairing machines used for hijab printing production so that they are more structured and carried out properly for all machines used. This design also contains various forms as supporting documents, such as machine damage report forms, initial damage checklists, machine damage reports, work order forms, inspection report forms, machine repair report forms, and machine repair evaluation report forms that can help workers in documentation and information so that evaluations can be carried out in the future.

Table 2 Corrective Maintenance Implementation Business Process

SOP for Corrective Machine Maintenance		
Flow Process	**Process Description**	**Supporting Documents**
	1. The operator finds damage to the machine and performs an initial check on the damage that has occurred	1. Machine failure report form
	2. The operator reports the machine damage directly to the production manager so that it can be handled immediately and calls an external technician	2. Machine failure report
	3. The production manager coordinates the machine damage to the purchasing department so that they can contact the technician to make repairs	3. Work order form
	4. The purchasing department will call an external technician to repair the damage to the damaged machine	4a. Work order form 4b. Contract or cooperation agreement with an external technician
	5. The external technician checks the damage to the machine	5. Inspection report form
	6. The external technician repairs the machine and conducts a test run with the operator	6. Machine repair report form
	7. The production manager evaluates the repair results and ensures that the machine can be reused for production operations	7. Machine repair evaluation report form
	8. After the evaluation, check, and the machine are in good condition, Purchasing will manage the payment of repair costs to the external technician	8a. Invoice from external technician 8b. Proof of payment

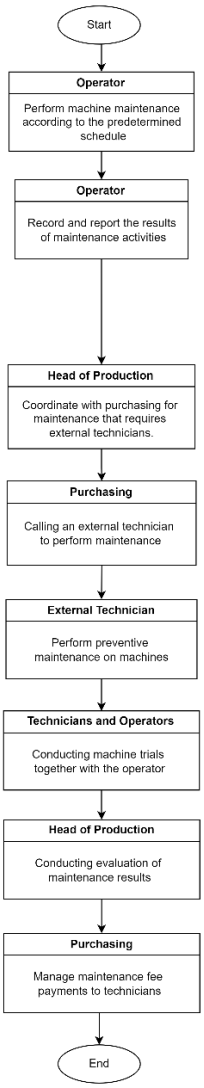
The figure shows the Corrective Machine Maintenance SOP flow, which starts with the operator identifying the problem when the machine experiences damage or malfunction. The operator reports the machine's condition to the Head of Production, who then evaluates and decides whether an external technician needs repairs. If spare parts are needed, the Purchasing team makes purchases to meet the repair needs. After the spare parts are available, the external technician repairs the machine under the supervision of the Head of Production. If the repair is complete, the technician reports to the Head of Production, ensuring the machine is back in good operation. This process also documents all maintenance stages, including spare part requirements and technical reports. This SOP ensures that machine repairs

are carried out systematically with good collaboration between operators, technicians, and the purchasing team so that repair time can be minimised and the machine can be back in operation immediately.

SOP for Preventive Maintenance Implementation

This SOP for preventive machine maintenance includes a series of clear and structured procedures to ensure that machine maintenance is carried out periodically and on time. With this SOP, it is hoped that preventive maintenance activities can increase machine life, prevent sudden damage, and maintain production efficiency in the company.

Table 3 Business Process for Preventive Maintenance Implementation

SOP for Corrective Machine Maintenance		
Flow Process	**Process Description**	**Supporting Documents**
	1. The operator performs maintenance on the machine according to the predetermined schedule and what maintenance will be carried out	1. Maintenance form
	2a. The operator records the maintenance results and whether the machine condition has returned to an acceptable condition 2b. After that, the maintenance results will be submitted to the production manager if there are no obstacles 2c. If preventive maintenance requires the services of an external technician, the production manager will coordinate with the purchasing	2. Routine maintenance activity report form
	3. The production manager contacts the external technician and makes a work agreement for complex preventive maintenance on the machine	3. Work order form
	4. The purchasing department will call an external technician to carry out preventive maintenance	4a. Cooperation agreement letter 4b. Work order form
	5. External technicians carry out more complex preventive maintenance as needed	5. External technician maintenance activity report form
	6. After maintenance is carried out, the technician and operator will test the machine to ensure everything is functioning properly	6. Machine test checklist form
	7. The production manager will evaluate after preventive maintenance is carried out and make adjustments to the schedule or procedure if necessary	7. Maintenance evaluation report form
	8. After the evaluation is carried out and the machine is in good condition and ready to use, purchasing manages the payment of maintenance costs to the external technician according to the agreed work agreement	8a. Invoice from external technician 8b. Proof of payment

The figure illustrates the SOP for Preventive Machine Maintenance, which begins with the Operator identifying machines that require maintenance based on the schedule or routine check results. The Operator then reports the findings to the Production Manager, who reviews the machine's condition and decides whether an external technician is needed to perform the maintenance. If there is a need for spare parts, the Purchasing team is responsible for providing or ordering the necessary components. Once the spare parts are available, the external technician and the operator perform the machine maintenance, where the Production Manager monitors this process. After the maintenance is completed, a maintenance

report is submitted and documented to ensure the machine's smooth operation in the future. This flow shows that preventive maintenance is carried out in a structured and collaborative manner, involving several parties to ensure the machine can operate optimally and prevent further damage.

Setting Key Performance Indicator

After improving business processes using the business process improvement method, key performance indicators are determined to determine performance measurement criteria in the business process. The following are the KPIs for repairing and maintaining machines in hijab printing MSMEs.

Table 4 Key Performance Indicator

Performance Indicators	Performance Description	Target	Formula	Measurement Frequency
Mean Time to Repair	Time required to repair a system or machine from malfunction	Time required for machine repair ≤ 2 hours per repair	$\frac{\text{Total time required for repair}}{\text{Number of repairs performed}}$	6 months
Scheduled Maintenance Frequency	The number of maintenances carried out every month according to the schedule	The percentage of preventive maintenance carried out on schedule is expected to be 100%	$\frac{\text{Scheduled maintenance completed}}{\text{Total maintenance}}$; 100%	6 months
Maintenance Costs	Costs incurred for maintenance	Total cost for repair and maintenance ≤ 1 million/month	$\frac{\text{Total maintenance cost}}{\text{Number of machines}}$	1 year

The table above displays the Key Performance Indicators (KPIs) used to measure the company's machine maintenance effectiveness. The first indicator, Mean Time to Repair (MTTR), shows the average time required to repair a damaged machine. The target is for the repair time to not exceed 2 hours per repair, with measurements carried out every 6 months. This indicator is important to ensure that machine downtime is minimized so that operations remain efficient. The second indicator is Scheduled Maintenance Frequency, which measures the frequency of preventive maintenance carried out according to schedule. The target is to achieve 100% implementation of scheduled maintenance, indicating the importance of adherence to the maintenance schedule so that sudden breakdowns can be avoided. Measurements are carried out every 6 months. The third indicator, Maintenance Costs, monitors the costs incurred for machine maintenance, with a total target cost not exceeding 1 million rupiah per month. This cost measurement is carried out annually to ensure cost efficiency without sacrificing maintenance quality. Overall, these three KPIs provide a comprehensive picture of the effectiveness of the maintenance program in terms of time, adherence to schedule, and cost efficiency.

Verification of Requirement ISO 9001:2015 Clause 7.1.3

The draft SOP will be verified with the requirements used whether it is by the ISO 9001:2015 standard clause 7.1.3. The following is a table of verification of the results of the draft SOP that has been made.

Table 5 Verification of Requirement ISO 9001:2015 Clause 7.1.3

Requirement	Design Results	Fulfilment of Requirements	Compliance
ISO 9001:2015 Clause 7.1.3	SOP for Preventive Machine Maintenance Planning	The organization shall determine and maintain the infrastructure necessary for the operation of processes to achieve conformity of products and services	In accordance
	SOP for Machine Maintenance Implementation	The organization shall implement regular maintenance processes, such as inspections and preventive maintenance, to maintain the reliability and effectiveness of the infrastructure	In accordance

	Supporting documents for machine maintenance and repair result reports	The organization shall retain documentation of the infrastructure, including specifications, maintenance records and other essential information, to demonstrate that the infrastructure is adequately monitored and maintained.	In accordance
	Machine maintenance spreadsheet form		In accordance

The table above shows the design results that comply with the requirements of ISO 9001:2015 Clause 7.1.3 related to machine maintenance, which focuses on the infrastructure required to ensure conformity of products and services. The resulting design includes an SOP for planning and implementing preventive machine maintenance by the organisation's requirement to establish and maintain infrastructure that supports the smooth running of operational processes. The SOP for implementing machine maintenance also ensures that the organization carries out periodic maintenance processes, including inspections and preventive maintenance, to maintain the reliability and effectiveness of the infrastructure. In addition, supporting documentation, such as maintenance and repair reports, demonstrates that the organization has complied with the obligation to retain documentation related to the infrastructure, including specification and maintenance records, as evidence of adequate monitoring and maintenance. The design also includes a spreadsheet form for machine maintenance, which supports documentation and reporting so that all infrastructure maintenance requirements are declared to have been met by the ISO 9001:2015 standard.

Maintenance Management Theory Verification

This stage verifies the results of the machine maintenance management SOP design, whether it is by the stages or maintenance steps of the maintenance management theory, according to Corder (1992). Verification details can be seen in Table V. 2 below.

Table 6 Maintenance Management Theory Verification

Requirement	Design Results	Fulfilment of Requirements	Compliance
Maintenance Management Theory	SOP for Preventive Machine Maintenance Planning, Machine list form	Determine what infrastructure will be maintained	In accordance
	SOP for Preventive Machine Maintenance Planning, Machine maintenance schedule form	Design and determine how the maintenance schedule for the specified infrastructure	In accordance
	Machine maintenance form and Machine repair form	Conduct preventive and corrective infrastructure maintenance	In accordance
	Work order form	Create work criteria that include a schedule and specifications for work during the maintenance process	In accordance
	Machine maintenance and repair activity results form	Create a history in the form of maintenance records that have been carried out	In accordance
	Machine maintenance and repair evaluation form	Conduct evaluations and inspections after maintenance is carried out	In accordance

The table presents the alignment of design results with the requirements of maintenance management theory, demonstrating that all aspects are fulfilled in accordance with the theory's principles. The SOP for Preventive Machine Maintenance Planning and the machine list form address the requirement to determine which infrastructure needs maintenance. The machine maintenance schedule form complements this by outlining how and when maintenance should be scheduled for the specified infrastructure. The machine maintenance and repair forms are used to conduct preventive and corrective maintenance, ensuring the infrastructure's ongoing reliability. The work order form also provides criteria for maintenance tasks, including scheduling and specifications, ensuring that all processes are carried out

systematically. The machine maintenance and repair activity results from create a maintenance history, documenting all maintenance activities performed, which supports transparency and accountability. Lastly, the evaluation form facilitates post-maintenance evaluations and inspections, ensuring that the maintenance has been effective and identifying any areas for improvement. Overall, the design results fully comply with the theoretical requirements, ensuring a structured and effective maintenance management process.

Validation

After the verification stage, the next step is the validation process. Validation evaluates the design results to determine whether they are in accordance with the company's needs and standards. The following table describes the validation in this study.

Table 7 Validation

Validation Aspects	Validation Target	Fulfillment
Performance Targets	Meflanna UMKM can easily understand the design results	The design results are made in easy-to-understand Indonesian and with clear steps
	The design results of the SOP for machine planning and maintenance are expected to provide clear guidance	The design results contain structured activities with supporting documents that can help users perform preventive and corrective machine maintenance
	The design results can help Meflanna UMKM in recording documented information about machine planning and maintenance	Supporting documents for the design results are made and attached to the design for each activity that will be carried out in machine maintenance and repair so that they are easily accessible to workers.
Stakeholder Targets	The design results can help stakeholders in routine scheduling of routine maintenance	The design results contain clear, structured, and easy-to-understand procedures
	The design results can help stakeholders in archiving repair and maintenance documents	The design results consist of forms needed by stakeholders

The table illustrates the validation aspects and how the design results meet the intended targets for Meflanna UMKM and stakeholders. Regarding performance targets, the design results are structured to be easily understood by the workers at Meflanna, utilizing clear and simple Indonesian language with step-by-step instructions. The SOP for machine planning and maintenance provides comprehensive guidance through structured activities and includes supporting documents that assist users in conducting preventive and corrective maintenance. Additionally, the design results offer tools to facilitate accurate record-keeping of documented information on machine planning and maintenance, ensuring that workers can easily access relevant documents during maintenance tasks.

As for stakeholder targets, the design results support routine maintenance scheduling through clearly defined and organized procedures, making it easier for stakeholders to follow and implement. Moreover, the design includes essential forms that assist stakeholders in properly archiving repair and maintenance documents, enhancing document management and ensuring a systematic approach to machine maintenance and repair activities. Overall, the design results meet the performance and stakeholder requirements validation criteria.

Analysis of SOP for Planning and Implementing Machine Maintenance

The SOP is created by adjusting the requirements of ISO 9001:2015 clause 7.1.3 and the theory of maintenance management. The following compares the existing conditions and the proposed SOP for machine maintenance in UMKM hijab printing.

Table 8 Analysis of the Results of the Design of SOP for Machine Maintenance Management

Design Results	Difference	
	Existing	**Proposal**
SOP for Preventive Machine Maintenance Planning	Previously, Meflanna UMKM did not have a preventive maintenance planning procedure that complies with the requirements of ISO 9001:2015 clause 7.1.3 and maintenance management theory.	There is a preventive machine maintenance planning procedure with several supporting documents so that MSMEs can plan maintenance activities more effectively and efficiently and avoid damage to the machine while production is in progress.
SOP for Machine Maintenance Implementation	Previously, UMKM Hijab Printing Meflanna did not have preventive or corrective machine maintenance procedures by ISO 9001:2015 requirements clause 7.1.3.	There is a corrective and preventive machine maintenance procedure with supporting documents so MSMEs can perform routine maintenance according to established procedures.

The following table compares existing and proposed conditions. The next step is identifying the advantages and disadvantages of the machine maintenance management SOP design results.

Potential Implementation of Digital Technologies

The potential application of digital technologies, such as the Internet of Things (IoT), in machine maintenance can increase the effectiveness and efficiency of the proposed SOP. Through IoT, sensors installed on machines can monitor machine conditions in real-time, such as temperature, vibration, and pressure, to detect early signs of damage. The data collected automatically can be analyzed using Machine Learning algorithms to predict when the machine needs maintenance. Thus, the maintenance SOP can be further developed to include data-driven predictive maintenance, allowing companies to respond to problems before major damage occurs. The application of this technology is not only in line with the Industry 4.0 trend but can also reduce machine downtime and repair costs.

Conclusion

A conclusion was drawn based on the research results, and a draft SOP for planning and implementing machine maintenance was produced. The results of the draft SOP for Planning and Implementing Machine Maintenance at UMKM Hijab Printing Meflanna meet the requirements of ISO 9001:2015 clause 7.1.3 and the PDCA cycle. This design uses the stages in the life cycle of the Business Process Management method. This final project research produces three procedures: maintenance planning, corrective maintenance implementation, and preventive maintenance implementation. The procedure also has supporting documents such as machine data and the type of maintenance to be carried out, corrective and preventive maintenance reports, evaluation result reports, and so on. According to Corder (1996), the SOP is also designed according to the maintenance management theory.

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