Utilization of Information System in Dies Control for Improvement of Quality and Production Efficiency in Manufacturing Industry

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Abstract. Utilization of Information Systems in Dies Control for Improvement of Quality and Production Efficiency in Manufacturing Industry is a system that is used to anticipate damage to dies before the dies are used, because if a damaged dies is used will be very detrimental to the company. There are 4 views: Dies master, Entry production, Dies maintenance and dashboard. Dies master is a page used for initial dies data input. Entry Production is a page that is used to input daily production output because from this page you will get actual OK production data and actual NG production which will be used to compare between the maximum use of dies and the number of actual OK production and actual NG production. If the sum of the actual Production OK and the actual NG production is greater than the maximum use of dies, the dies must be maintained immediately. Maintenance Dies serves as input data for maintenance Dies, in the maintenance dies page there are also 3 features: Entry Maintenance Dies functions as a date data input menu and only comments mainly because other data already exists on the master dies, Summary on Maintenance dies serves to display the date or last maintenance date and the last maintenance time interval with today, the Details on the Maintenance Dies function displays all dates if the summary only shows one last date the details display all dates, so you can find out how many times the dies have been maintained. and the last is this Dashboard function to display the results of all data that has been inputted. The main function is to display the status of dies, it will be seen if the red color of the dies has to be fixed, if the yellow color is warning because the number of hits is 90% of the maximum result of using dies, if green can still be used.

1. Introduction
The Industrial Revolution 4.0 (I4.0) can be interpreted as interfering in an intelligent and automated system in the industry [1]. This revolution had a direct impact on the results of the company's goods, which caused disruption of traditional concepts used in the production system. I4.0 has additional features that are influenced by the Internet of Things (IoT) and Digital Services, and the Cyber-Physical System (CPS) that is used to combine advanced information and communication technology for the integration of the physical, virtual and digital world [2]. Wireless communication systems have a high degree of mobility and high data rate [3]. In short, Industry 4.0 industry players let computers connect
and communicate with each other to finally make decisions without human involvement. The combination of physical-cyber systems, the Internet of Things (IoT), and the Internet of Systems makes Industry 4.0 possible, and makes smart factories a reality. 4.0 technology is considered as an intelligent entity that is able to communicate with machines, by providing production that is processed on demand, to meet customer needs [4].

Dies are molds that are used to produce products that have the same shape quickly and in large quantities. Product quality, shape and function of the product are determined by the quality of the mold used to produce the product. In that case, it is very important to improve the quality of the mold to improve the quality of the product, but it is very difficult to control the quality of the mold because if the mold is used continuously it is damaged, generally the mold is made by the collaboration of many companies. This problem leads to the need for effective collaboration naturally, and this paper discusses the construction and application of a print quality control system. To control mold quality, we create a quality information database for quality management, product quality and quality requests from buyers, therefore a mold quality management system and inspection system are established. By using this quality management system, quality standards and quality information can be known by the company and applied for inspection, and as a result the print quality increases [5].

Information System Preventive Maintenance Dies is an application created with the aim of making it easier for companies to detect the feasibility of using a dies. Currently PT Trimitra Chitrahasta's preventive maintenance system is still using the manual method by placing 2 rows of bags on the board that are in the maintenance line, the top row for the names of dies that have not been prefabricated and those in the bottom row for the names of dies that have been preventive. Before preventing, maintenance will see the schedule that has been made by the PPIC. Because the system is manual, it takes a long time to detect which dies are new and old. If dies passes from the maximum use of dies with the maximum struck reference that has been determined by the company, it is feared that the dies will suffer damage, if the dies are damaged, the resulting product will also experience defects (NG) that is very detrimental to the company because it will make the customer disappointed and worse the customer is no longer trust the company because it is considered unprofessional.

From the problems above, the Preventive Dies Maintenance Information System application is made to make it easier to find out the status of dies so that dies do not occur more than the maximum usage. With this application it can also reduce damaged production (NG), expand maintenance lines because what is supposed to be for the boards can later be used for maintenance.

2. Dies

PT Trimitra Chitrahasta is engaged in automotive manufacturing, specifically in the manufacturing of Metal Stamping, for 2-wheeled and 4-wheeled vehicle components. When the raw material arrives, there will be a check of the iron plate in the material warehouse with the incoming material section. The raw material will be checked thick by the material plate, checking the condition of the material body, whether in good condition or not. Furthermore, the goods will enter the shearing plate process, in this process the plates will be cut rectangular according to the standards set by the company, but there are also plates ordered by the customer that have been cut directly and the company, will only do the stamping process and subsequent processes. After going through the shearing process, the plate will go to the stamping (press) section. In this process, stamping of the half-finished will be put into work in process to wait for the next process, which is meant by work in process is a semi-finished item that has gone through a production process rounting, but has not really finished so the product cannot be said yet. Dies is a supporting tool in the stamping process, if defined dies are molds that are driven by a press to press or press certain material-producing materials. PT Trimitra Chitrahasta itself has a Dies Workshop facility that supports for the smooth production process.

Dies is a supporting component of production which has an important role in producing products called sheet metal parts. Dies generally have 2 functions, namely as a cutter and forming sheet metal material. The forming process is a simple sheet metal forming process or a shallow drawing process without the use of a blank holder, and the contours of this process are irregular 3-dimensional products.
In its course, the dies require maintenance to improve the reliability of the dies and to maintain the continuity of the production process and to avoid the stop line where production activities stop temporarily due to the repair of damaged dies. Reliability is defined as the probability (probability) of a unit or system to function normally if used according to certain operating conditions for a certain period of time. To increase the reliability of a machine or equipment, maintenance is needed. While maintenance can be defined as a series of activities aimed at returning the condition of a machine or equipment to a condition or function. Preventive maintenance is one of the important programs in the company to ensure the appropriateness of the tools to be used for the production process. Preventive can be interpreted as a precaution before minor damage or even fatal to the tool [6].

3. Information system
system is a term that can be described as a specific process aimed at capturing, designing, testing, and practicing software programs or applications, there are also some special internal systems, internal development, database system development, or third-party acquisitions that are developed. In developing a system, there are several important steps that must be learned by an organization: identifying a problem, analyzing and understanding a problem, identifying requirements, identifying alternative solutions and using the best actions, designing the chosen solution, applying the chosen solution, and evaluating the results [7].

According to history, data are facts that refer to objects and events that can be recorded and stored on computer media. For example, in a customer details database, data can include various types of facts, such as customer names, customer addresses, customer e-mails, and customer telephone numbers. Another example is structured data specifically that has data types, for example numeric, characters, and dates. While the understanding of information is data that has been processed into a valuable or meaningful form that has been processed in a particular way where user knowledge will be enhanced. While the system is a collection of several components consisting of several elements, these components and elements can be tangible objects or methods that are interconnected, interact and work together regularly to achieve the desired goals. Information systems are formed from two different words in order to create collaboration between information and systems referring to a collection of hardware, software, data, people, and also procedures that work together to create a good quality of information [7]. Information system implemented by a form of software that collaborate those things, the common way to create a software itself is programming.

Programming is a process for implementing algorithms using a programming language. And understanding the algorithm according to Rinaldi is a sequence of steps to solve the problem. While the algorithm according to Levitin is a series of clear instructions to solve the problem, namely to obtain the desired output from a limited number of inputs. Thus it can be said that learning programming means learning how to solve problems. So students who are just starting to learn programming are also required to be able to solve problems in a manner arranged, systematic and integrated before solving the problem is outlined in the form of a computer program [8]. There are a lot of programming language that can be used to create the software such as Python, Java, C#, etc. The programming language that used in this information system is Java.

The main reason Java is used, because Java is preferred by all segments because it includes all aspects from desktop programming to mobile programming (Mobile Programming) and Java also famous for being portable, because of the entire operating system can run Java, the operating system among others Window, Linux, DOS, Unix and others. Gradle improved from the best ideas by Make, Ant, Ivy, Maven, Rake, Gant, Scons, SBT, Leinengen, and Buildr. Previous best-of-breed features are scattered on between a set of tools now available through Groovy DSL for scripting and Java API for tooling [9].

When the level of manufacturing complexity increases, and when factory yields, equipment reliability, and equipment utilization are not optimal, we must look for programs that can be used to reduce production costs and help manage increased plant complexity. There are a number of possible systems such as automating the routine decision making processes involved in the manufacturing
process, producing faster time decisions indirectly can be more cost-effective, applying manufacturing knowledge to reduce the time needed to detect, analyze, and resolve time problems. Such a program is an automation program that can help manage factory performance. Physical automation to replace human physical work activities, while information automation to replace data collection systems that are usually carried out by humans or data analysis procedures [10].

The system used to manage production management to help businesses operate systematically aims to reduce work errors. Information systems can be implemented when administrators or users need a new system or optimize the original system [11]. Another manufacturing system that can be collaborated with information systems is a semi-automatic data collection system. One of the objectives of this project is to generalize the use of results for further implementation using the same method for all companies engaged in manufacturing. In the future information systems are needed to increase reduce production costs and increase work time efficiency. Automatic data can be supplemented against the background of production disruptions which will be the case in future case studies [12].

Nowadays there are many experts define the system. Some understanding of the system taken in the present study is a notion given by author in [9]. Author in [9] provides understanding of the system as a group of closely related elements its relation to one another, which is function together to achieve specific goals. In the sense the other, the system is defined as a collection or set of elements, component, or organized variable, mutual interaction, interdependent one each other, and integrated. In essence, a system is a group of entities (hardware, brainware, software) mutual interact, collaborate and collaborate to achieve goals certain.

Information can be obtained from an information system (Information System) or also called Processing Systems or Information Generating Systems. According to Robert A. Leitch and K. Roscoe Davis Information systems are internal systems an organization that meets the needs of daily transaction processing, support operations and provide certain outside parties with reports in need. According to Gordon B Davis, an information system is a system that connecting users (individuals and organizations) with computers that are designed in an integrated manner to provide information that supports operational functions, management, analysis and decision making functions in an organization [13].

4. Materials and methods
Process Analysis In making this system is designed and made an integrated system regarding the collection of information related to the process of input and data storage as seen in DFD.
Broadly speaking the data flow from the system is as follows:

**Figure 1. DFD Data Storage and Input Processes**

**Figure 2. DFD All Process**
All dies data is inputted in master dies, dies maintenance, and entry production. Dies master will provide data to Dies maintenance and Entry production with the code used ID. Maintenance dates and comments are entered at the dies maintenance entry. Production data inputted to Entry production. Later all the data will be a requirement to determine the feasibility of using dies.

Data storage after the data is inputted, the data will be stored on a server with 3 databases namely master, maintenance, and production. The database is interconnected with an index ID input so that one database can retrieve existing data in another database. Other than that storage on the server aims to make data safer and can be accessed by companies.

Data Modeling

Data modeling used in this information system uses ERD (Entity Relationship Diagram) in the development of applications that are closely related to data, then ERD is one of the facilities that are needed because it can facilitate the development of applications. In addition, ERD can also be used as a reference for further application development. Picture of the relationship between data used in this information system can be seen in the picture:

Figure 3. Entity Relation Diagram
The master dies is the subject of data retrieval. Entrydies retrieve the index ID from the database of calculations to display displayed on the application. Whereas entry_oee_tbl takes the codex production index to display in the application.

5. Results and discussion
Dies is a mold that is used to form a slab into a form that has been designed in advance. In this metal stamping industry dies play an important role, so that customers are not disappointed and continue to work together, the quality of spare parts made must be good, there are no defects, even though PT Trimitra Chitrahasta does not have a proper monitoring system to anticipate dies damage because if dies are damaged or abnormality will affect the results, can be said to be not precise. Timeliness of production is also an important factor because the customer does not want any items that are sent late because it inhibits production from the customer's company. This is very much avoided because quality and timeliness are the main capital for PT Trimitra Chitrahasta to satisfy and be trusted by customers. From the above problems that made the Monitoring Maintenance Dies application project, the operator no longer collected a lot of paper to find out the number of strokes used. All data is already in the database, the operator only input maintenance date. When production is nearing the maximum stroke limit, there will be a notification of the status seen in the application. Dies will be repaired before dies can be used again. The following are the uses of each display in the application Utilization of Information System in Dies Control for Improvement of Quality and Production Efficiency in Manufacturing Industry.

5.1 Mater Dies
Dies Master is a page that is used for initial data input. For example there are new Dies that have not been listed or recorded then this menu must first be filled.
5.2 Entry Production
Production Entry is the page used to input daily production output because from this page you will get actual OK production data and actual NG production which will be used to compare between the maximum use of dies and the number of actual OK production and actual NG production. If the sum of the actual Production OK and the actual NG production is greater than the maximum use of dies, the dies must be maintained immediately.

5.3 Maintenance Dies
Dies Maintenance functions as input Dies maintenance data, such as input dates and information on damage to dies. In this menu there are 3 views that have different functions, including:

5.3.1. Display Entry Maintenance Dies.
Dies Entry Maintenance functions as a date data input menu and only comments mainly because other data already exists on the master dies.
5.3.2. Display Summary.

Summary on Maintenance dies functions to display the date of the last maintenance date and the last maintenance time interval from today.

5.3.3. Display Detail.

Details on the Maintenance Dies function displays all dates if the summary only shows one last date. The details display all dates, so you can find out how many dies have been maintained.
5.4 Display Dashboard

This dashboard functions to display the results of all data that has been inputted. Its main function is to display the status of dies, it will be seen if the red color of the dies must be corrected, if the yellow color is warning because the number of struck is 90% of the maximum use of dies, if green can still be used.

![Figure 10. Display Dashboard](image)

The system that I made has advantages over the system used before. This system is more effective and easier because the previous system is still manual using boards and paper that have been prepared by PPIC. While the system that I created automatically can be directly seen on the dashboard display dies which must be immediately replaced or repaired. Operators no longer collect a lot of paper to find out the number of strokes used. All data is already in the database, the operator only input maintenance date. When production is nearing the maximum stroke limit, there will be a notification of the status seen in the application. Dies will be repaired before dies can be used again. Thus, dies damage can be minimized with this information system.

The weakness of the system that I made is, before using the system there is a need for guidance because not everyone understands how to use it, because every page has different uses and the order of filling that must be coherent.

6. Conclusion

Through the application of the Utilization of Information Systems in Dies Control to Increase Production Quality and Efficiency in Manufacturing Industry, it is expected that companies can reduce production costs by reducing the production of goods that fail or are damaged due to dies being repaired late, anticipating the presence of goods that are not fit for use because they can increase production costs by wasted material, increasing customers confidence with the timeliness of order completion, and facilitating maintenance staff in monitoring the feasibility of dies so as not to exceed maintenance time or beyond the life span because if this happens the goods produced will be defective.

References

[1] Petrasch R and Hentschke R 2016 Process modeling for industry 4.0 applications: Towards an industry 4.0 process modeling language and method Proc. 13th Intl. Joint Conf. on Computer Science and Software Engineering(Khon Kaen) vol 2016 (IEEE) p 1-5.

[2] Herliana A, and Rasyid P M 2016 Sistem Informasi Monitoring Pengembangan Software Pada Tahap Development Berbasis Web Jurnal Informatika, vol 3 no 1 p. 41-50.
[3] Pramono S, Hariyadi T, and Subagio B B 2015 Performance analysis of transceiver 4 × 4 space time block coded MIMO-OFDM system Proc. 2nd Intl. Conf. on Info. Tech. Comp. and Electrical Eng. : Green Tech. Strengthening in Info. Tech. Electrical and Comp. Eng. Implementation (Semarang) vol 2015 (IEEE) p 426-429.

[4] Pisching M A, Pessoa M A O, Junqueira F and Miyagi P E 2018 "PFS/PN Technique to Model Industry 4.0 Systems based on RAMI 4.0 Proc. IEEE 23rd Intl. Conf. on Emerging Tech. and Factory Automation (Turin) vol 2018 (IEEE) p 1153 – 1156

[5] Choi Y, Shin J, Choi H, and Lee S 2010 Quality management system for web-based collaboration in mold & die industry Proc. The 40th Intl. Conf. on Computers & Indutrial Engineering (Awaji) vol 2010 (IEEE) p 1-5.

[6] Andira and Putra A G B 2017 Perencanaan Perawatan Preventif pada Blanking Dies untuk Mengurangi Biaya Operasinal Journal of Industrial Engineering, Scientific Journal on Research and Application of Industrial System, vol 2 no 1 Maret 2017 p. 56-64.

[7] Sari D P, Putra S J and Rustamaji E 2014 The development of project monitoring information system (Case study: PT Tetapundi Prima Kelola) Proc. in 2014 Intl. Conf. on Cyber and IT Service Management (South Tangerang) vol 2014 p 39-43.

[8] Isroqmi A 2015 Pemilihan Bahasa Pemrograman Pada Mahasiswa Non Komputer (Studi Kasus: Program Just BASIC) Jurnal Dosen Universitas PGRI Palembang vol 3 p 221 – 232

[9] Roviaji R, and Muslim M A 2017 Pembuatan Sistem Informasi Gardu Induk PT. PLN Prosiding Seminar Ilmu Komputer dan Teknologi Informasi vol. 2, p 82 - 185.

[10] Meieran E S 1993 Intelligent Manufacturing System Proc. 15th IEEE/CHMT International Electronic Manufacturing Technology Symposium (Santa Clara) vol 1993 (IEEE) p. 323 – 327

[11] Petcharat T, Pruitikanee S, and Kongcharoen J 2018 Salted Eggs Manufacture Management of Information System: A Case Study of Seang – Detch Farm Proc. The 2018 Technology Innovation Management and Engineering Science International Conference (Bangkok) vol 2018 (IEEE) p 1-5.

[12] Ingemansson A, and Oscarsson J 2005 Discrete event simulation and automatic data collection improve performance in a manufacturing system Proc. of the 2005 Winter Simulation Conference (Orlando) vol 2005 (IEEE)p 1-6.

[13] Gustiana I 2013 Perancangan Sistem Informasi Penjualan On Line Pada PT. Ochikawa Headwears Project Jurnal Teknologi dan Informasi UNIKOM, vol 2 no 1 p 1-15.