

INTERNSHIP REPORT
WESTERN DIGITAL (THAILAND) Co., Ltd.



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APPROVAL

The internship report which is written based on the internship at Western Digital (Thailand) Co., Ltd. during the period at April 19, 2017 to August 19, 2017 by:

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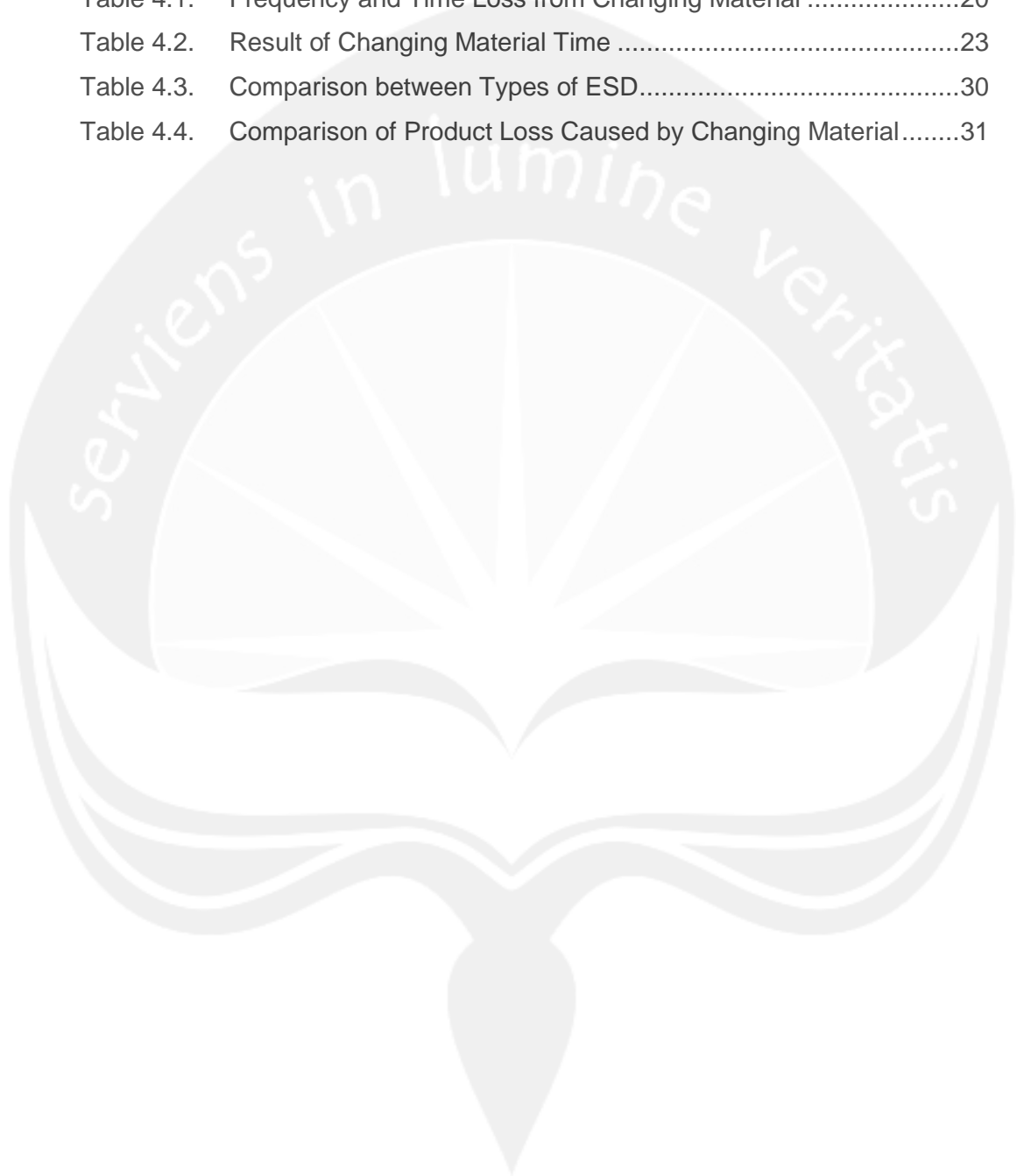
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TABLE OF CONTENT

| | |
|---|-----------|
| Title Page | i |
| Identification page..... | ii |
| Approval | iii |
| Acknowledgement | iv |
| Table of Content | v |
| List of Table | vi |
| List of Figure..... | vii |
| Appendix | ix |
| | |
| Chapter 1. Introduction | |
| 1.1. Background of Internship..... | 1 |
| 1.2. Objective of Internship | 2 |
| 1.3. Internship Location and Schedule..... | 2 |
| | |
| Chapter 2. Company Background | |
| 2.1. Company Profile | 3 |
| 2.2. Organizational Structure | 6 |
| 2.3. Management of the Company..... | 6 |
| | |
| Chapter 3. Company System | |
| 3.1. Business Process of Department | 9 |
| 3.2. Product | 10 |
| 3.3. Production Process..... | 14 |
| 3.4. Production Facility..... | 17 |
| | |
| Chapter 4. Internship Assignment | |
| 4.1. Assignment Scope | 18 |
| 4.2. Rights and Responsibilities in the Assignment..... | 20 |
| 4.3. Methodology to Complete the Assignment | 21 |
| 4.4. Result of Internship Assignment..... | 23 |
| 4.5. Evaluation | 31 |
| | |
| Chapter 4. Conclusion..... | 32 |

List of Table

| | | |
|------------|---|----|
| Table 2.1. | Locations of WD..... | 5 |
| Table 3.1. | List of WD Products..... | 10 |
| Table 4.1. | Frequency and Time Loss from Changing Material | 20 |
| Table 4.2. | Result of Changing Material Time | 23 |
| Table 4.3. | Comparison between Types of ESD..... | 30 |
| Table 4.4. | Comparison of Product Loss Caused by Changing Material..... | 31 |



List of Figure

| | |
|---|----|
| Figure 2.1. Organizational Structure of Operation Planning Dept | 6 |
| Figure 3.1. Business Process of Operation Planning Dept | 9 |
| Figure 3.2. General Flow of Production Process | 14 |
| Figure 3.3. Part of Hard Drive | 15 |
| Figure 3.4. Assembly Process Flow | 15 |
| Figure 3.5. Back End Process Flow | 16 |
| Figure 4.1. Back End Automation..... | 18 |
| Figure 4.2. Back End Automation Machine..... | 19 |
| Figure 4.3. Back End Automation Machine Layout..... | 19 |
| Figure 4.4. Project Stage..... | 21 |
| Figure 4.5. SMED Technique | 22 |
| Figure 4.6. Example of Working Instruction Document..... | 24 |
| Figure 4.7. Example of Slide for Working Instruction | 24 |
| Figure 4.8. Example of Best Practice Video | 25 |
| Figure 4.9. Illustration for Changing ESD Bag..... | 25 |
| Figure 4.10. Visual Alignment Proposed in BEA Machine | 26 |
| Figure 4.11. Current and Proposed ID Package Area | 27 |
| Figure 4.12. BEA Layout | 28 |
| Figure 4.13. Current and Proposed Flow for Changing ESD | 28 |
| Figure 4.14. Proposed Printer Cover | 29 |
| Figure 4.15. Current and Proposed Slider in Printer | 29 |
| Figure 4.16. Current and Proposed Silica Roller | 30 |
| Figure 4.15. Proposed Material Handling | 31 |

APPENDIX

- Appendix 1. Changing Materials Before and After
- Appendix 2. Work Instruction Document
- Appendix 3. Work Instruction Slide
- Appendix 4. RULA of Changing ID Package (Before)
- Appendix 5. RULA of Changing ID Package (After)
- Appendix 6. REBA of Material Handling (Before)
- Appendix 7. REBA of Material Handling (After)
- Appendix 8. Daily Log of Working Activities



CHAPTER 1

INTRODUCTION

This chapter will focus on introduction which consist of background, objective, internship location and schedule

1.1. Background of Internship

Department of Industrial Engineering, Universitas Atma Jaya Yogyakarta (PSTI UAJY) defines the internship as a simulator that enables the students not only to apply the Industrial Engineering knowledge into real-world industry but also to train the student how to be a professional of Industrial Engineer. For this purpose, during the internship the students are requested to work in the host company for a period of one month.

The students should keep in their mind, that the paradigm of internship is that the students are expected to experience the application of Industrial Engineering knowledge in practice in which it can be obtained if during their internship the students do some activities to enhance their understanding in term of planning, designing, improving, implementing and problem solving. Therefore during the internship periods the students are requested to:

- a. Doing all the tasks that have been assigned by the host company
- b. Following all of relevant working procedures of the host company
- c. Capturing the big picture of the enterprise system in the host company and observing its characteristics

Since Industrial Engineer is dealing with the integrated system of some elements which are Man, Machine, Material, Methods, Money, Energy, Environment and Information, therefore during the internship the students should relate all of their activities in term of system perspective. Based on the explanation above, it is clearly seen that internship is not only gathering the data.

According to the Curriculum Document of PSTI UAJY, internship is an academic course in which the students should register for the course for 2 credits. Then, in order to fulfill the academic requirement of internship, the students are required to submit an internship report. The performance of the student itself is evaluated both by on-site supervisor and by faculty supervisor.

1.2. Objective of Internship

The aims of the internship are:

- a. Practice discipline
- b. Improve the interaction between student and his/her ordinate or workmate
- c. Practice adaptability in the working atmosphere
- d. Observe the daily work in the host company
- e. Enhance the Industrial Engineering knowledge in practice by seeing the practical work in the host company
- f. Enhance the knowledge of enterprise system

1.3. Internship Location and Schedule

The internship was held in Western Digital (Thailand) Co, Ltd. which located in 140 Moo 2, Bangpa-In Industrial Estate, Udomsorasayuth Road, Klongjig Bangpa-In, Ayutthaya 13160 Thailand.

The internship duration started from April 19, 2017 until August 18 2017. At the first month, student has opportunity to know about the company and started to discuss the project that should be done. Next, student observe and work on the project. It started with idea proposed, implement in the line, then observe again as the evaluation. The idea that accepted but still not implement yet become suggestion for company. At the last, every works should be submitted and presented.

CHAPTER 2

COMPANY BACKGROUND

This chapter is consist of Company Profile, Organization Structure, and Company Management.

2.1. Company Profile

Western Digital Corporation is an American computer data storage company and one of the largest computer hard disk drive manufacturers in the world. The company is one of the largest independent makers of hard-disk drives (HDDs), which record, store, and recall volumes of data. It is also active in the fast-growing area of solid-state drives (SSDs), which are faster and lighter than HDDs. Drives for PCs account for most of Western Digital's sales, although the company also makes devices used in servers, cloud computing data centers, and home entertainment products such as set-top boxes and video game consoles. The company sells to manufacturers and through retailers and distributors and generates more than half its sales from the Asia/Pacific region.

History

Western Digital was founded on April 23, 1970, by Alvin B. Phillips, a Motorola employee, as General Digital, initially a manufacturer of MOS test equipment. It rapidly became a specialist of semiconductor maker, with start-up capital provided by several individual investors and industrial giant Emerson Electric. Around July 1971, it adopted its current name and soon introduced its first product, the WD1402A UART (Universal Asynchronous Receiver Transmitter).

By the early 1980s, they were making hard drive controllers and won contract to provide IBM with controllers WD 1003 for the PC/AT. That controller became the basis of ATA (Advanced Technology Attachment) interface. They earn many profit from this sales. They develop the company and purchased lot of hardware companies. One of the best products was WD Paradise VGA Card. Their biggest money maker was storage-related chips and disk controllers.

In the 1990s, things were started to slow down. WD create new brand called WD's caviar drives. This was one the best product on that year. Contrary to that, WD sold their several products. WD Paradise was sold to Philips and any other products also sold to another hand. Around 1995, new offering from other

company especially Quantum affected WD and WD fell into slump. The sales was bad and the condition became worst. In attempt to rise up, WD try to ask help from IBM. In 1998, this agreement gave WDC the rights to use certain IBM technologies. The result was Expert line of drives and WD regained respect among users, although they should recall their product because of the bad motor. Then WD broke ties to IBM.

In the 2000s, WD made a lot of breakthrough. They became the first manufacture to offer mainstream ATA hard disk drives with 8 MiB of disk buffer. They was improving their products so much. In 2003, WD acquire Read Rite Corporation and in the same year they also offered 10.000 rpm Serial ATA HDD. In 2006, WD introduced its My Book line and one year later they produce 1 TB hard drive which is the largest capacity in its My book line. In 2007, WD acquired magnetic media maker Komang. In the same year, WD adopted perpendicular recording technology and also started to produce energy efficient GP (Green Power). In 2008, WD announced the next generation called WD Veloci Raptor which is 35 percent faster than previous generation. The next year, WD introduced the first 1 TB mobile hard disk drive, which shipped as both a Passport series portable USB drive as well as Scorpio Blue series notebook drive,

In the 2010s, WD still made a lot of improvement and they acquired many companies. In 2010, WD acquired the magnetic glass media called HOYA Corporation. WD products became high end product using magnetic glass media. In this year WD announced their 3 TB internal hard disk drive. In 2011, WD acquired Hitachi and one year later WD became the largest traditional hard drive manufacture in the world. In 2013, WD improved quality of their products and they claim 49% of reduction in power usage per terabyte of storage. In 2014, WD introduced a New Purple line of hard drive which has capacities from 1 up to 4 TB and also new helium filled 6 TB, 8 TB, and 10 TB hard disk drives. Besides launched a lot of products, WD also acquired Skyera, a flash based storage development company. In 2015, WD announced Blue hard drives which has capacities up to 6 TB. The latest was in 2016 when WD also acquired San Disk.

Strategy

Western Digital is one of a handful of manufacturers that dominate the hard-disk drive market, a sector characterized by harsh competition, short product life cycles, and aggressive price cuts.

In July 2016 the company said it had developed its 3D NAND technology, BiCS3. It is stacked with 64 layers of vertical storage capability. Beyond the BiCS3, Western Digital plans to develop and commercialize more 3D NAND technologies over the coming years.

The company is working with Toshiba, its partner in flash memory production, to develop 3D resistive random-access memory (ReRAM) technology. Another collaboration is with Hewlett Packard Enterprise Development on 3D ReRAM for use in storage class memory applications.

In 2015, Western Digital sold a 15% stake to Unisplendour, a unit of Tsinghua Holding of China, for \$3.7 billion. The deal infuses a good amount of money into Western Digital, which is could use to further build its flash storage business. It also provides a channel for boosting sales in China, where Western Digital's sales plunged 22% in 2015 from 2014.

In association with Unisplendour, Western Digital began a \$300 million joint venture that focuses on storage devices and big data services. The enterprise is based in Nanjing, China and it will develop products for the China market.

Location

As a worldwide market targeted, WD has a lot of location which can be shown in Table 2.1.

Table 2.1 Location of WD

| Area | Country |
|---------------|--|
| North America | Canada, United States (Irvine, California; Mountain View, California; San Jose, California; Fremont, California; Longmont, Colorado; Belleair, Florida; Pasadena, Maryland; Reading, Massachusetts; Bellevue, Washington; Cleveland, Ohio; North Sioux City, South Dakota; Austin, Texas; Dallas, Texas; Houston, Texas; Salt Lake City, Utah) |
| Europe | Czech Republic (Prague), France (Issy les Moulineaux), Germany (Dornach bei München), United Kingdom (Leatherhead), Netherlands (Schiphol, Amsterdam) |
| Asia | India (Bangalore); China (Beijing, Shanghai, Shenzhen); Hong Kong; Taiwan (Taipei); Japan (Tokyo); South Korea (Seoul); Malaysia (Petaling Jaya, Penang, Johor Bahru); Singapore; Thailand (Ayuthaya, Pathumthani); United Arab Emirates (Dubai) |

2.2. Organizational Structure

Western Digital has more than 4000 workers. There are worker who working in office and worker who working in shop floor. They have many departments for managing, controlling, and make sure that production running well. The production system is not automated and they have many operators. Student placed in office and working with Operation Planning Department. This department is focused into two parts; scheduling and improvement. For this occasion, student placed in improvement area. The organizational structure is shown in Figure 2.1.

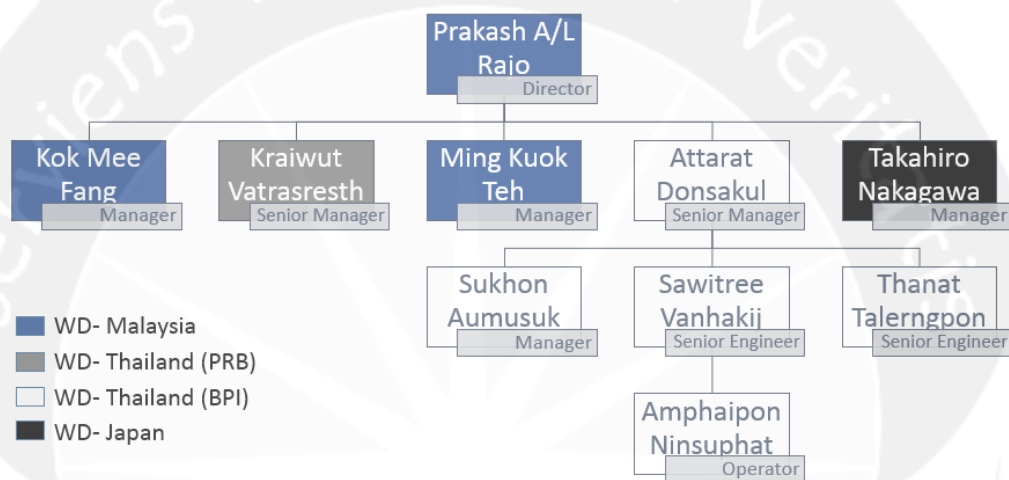


Figure 2.1 Organization Structure of Operation Planning Dept.

Student's mentor is positioned as Senior Engineer, while Student's supervisor is positioned as Senior Manager. Both of mentor and supervisor are placed in Bang Pa-In site. Main focused of this team are improvement on shop floor. Senior Engineer have to give weekly report to Senior Manager, then Senior Manager will revise and submit to Director which placed in Malaysia.

2.2. Management of the Company

Vision:

To empower people to create, manage, experience and preserve digital content

Mission:

To sustainably delight customers with an unmatched experience, product breadth, quality and reliability

The WD Way is the way of the company implements knowledge of behavior and values to the employee. These are the WD Way

Integrity

- a. Deals with people honestly, openly, and respectfully
- b. Ensures words and actions are consistent
- c. Admits mistakes
- d. Influences to others to act with integrity when faced with ethical situations
- e. Maintains confidentiality
- f. Speaks up when faced with others' contrary opinions and ideas
- g. Represents information and data accurately and completely

Passion

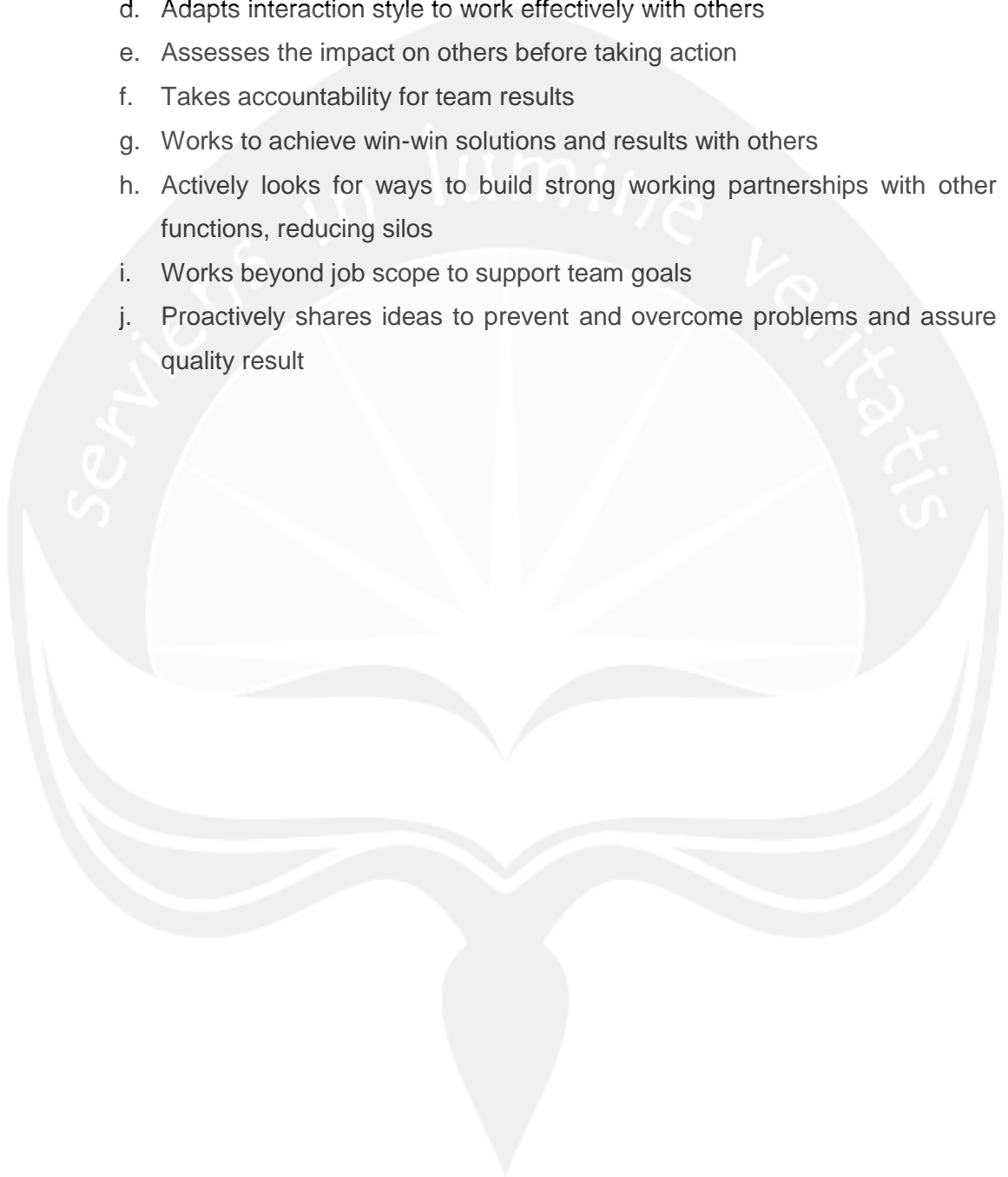
- a. Demonstrates energy and commitment, even in the face of significant challenges
- b. Shows commitment to colleagues and is actively engaged in organization "life"
- c. Faces changes and challenges with resilience and a positive attitude
- d. Takes personal responsibility to resolve issues and provide effective solutions
- e. Commits to professional growth and development
- f. Coaches and provides guidance to others
- g. Committed to growth, welcoming and using coaching and feedback
- h. Looks for and addresses the impact of process, policies, practices, actions and decisions on customers
- i. Routinely plans for successful results, includes taking preventative action
- j. Intensely focuses on achieving quality results

Innovation

- a. Applies new ideas to improve products and processes to benefit the business
- b. Demonstrates innovative and creative thinking
- c. Uses critical thinking to solve problems
- d. Influences others to implement new ideas to benefit the business
- e. Identifies and removes barriers that impact achievement and excellence
- f. Supports others' new ideas and innovative thinking
- g. Is not afraid to take risks and try new things

Collaboration

- a. Positively influences others when faced with change and challenge
- b. Supports others without being asked
- c. Seeks first to understand before being understood
- d. Adapts interaction style to work effectively with others
- e. Assesses the impact on others before taking action
- f. Takes accountability for team results
- g. Works to achieve win-win solutions and results with others
- h. Actively looks for ways to build strong working partnerships with other functions, reducing silos
- i. Works beyond job scope to support team goals
- j. Proactively shares ideas to prevent and overcome problems and assure quality result



CHAPTER 3 COMPANY SYSTEM

This chapter is explained about company system which consist of business process, list of product, production process, and production facilities.

3.1. Business Process of the Department

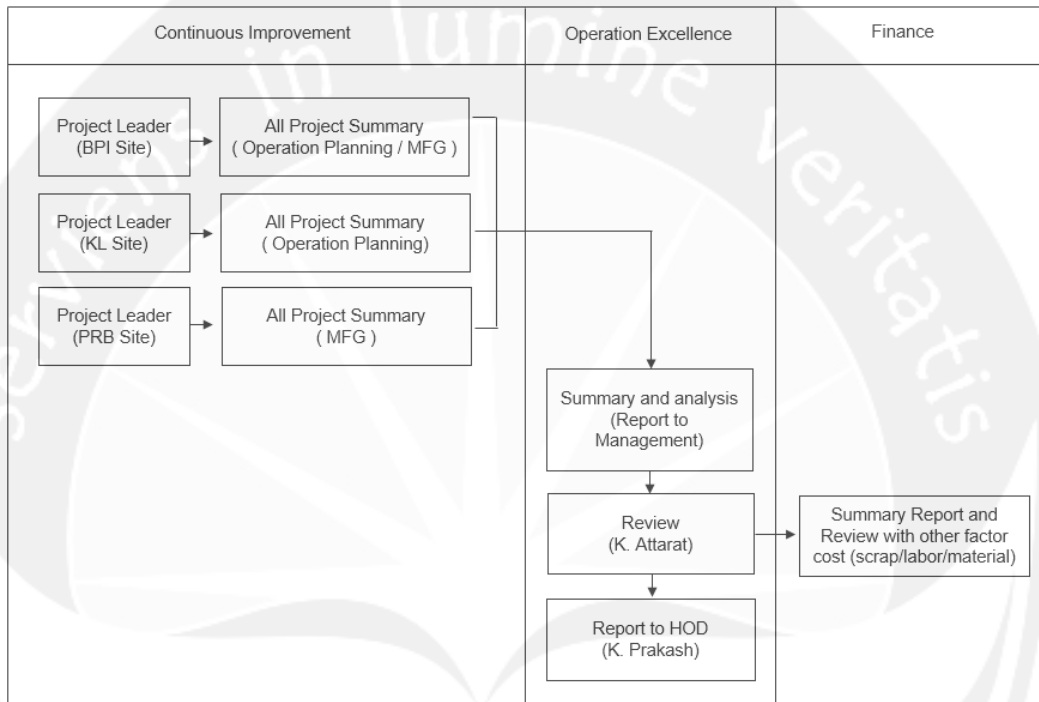


Figure 3.1 Business Process of Operation Planning Department

This department don't have same regular job in daily work. They always have project and each project will have its own timeline. The project is involved the other department and lead by this department. They have three project leaders based on site, there are Bang Pa-In site, Kuala Lumpur site, and Prachinburi site. Each project leader have to send the project summary and analysis report. Before they make summary and analysis, they have to make sure if the project is accepted in the shop floor. They have to discuss with other department related with the project field. If the project is not accepted, leader have to discuss it again, or the worst case is changing the project field.

Project leader have to send summary as a weekly report to K. Attarat (Senior Manager). After that K. Attarat will give report to K. Prakash as Director and send Summary Report to Finance regarded to budget investment and company gain.

3.2. List of Product

There are varied product of Western Digital which can be shown in Table 3.1. It has many variants model, function, and capacity. The products are divided into categories, namely External Storage, Personal Cloud Storage, Portable Storage, Internal Hard Drive Storage, Internal Hard Drive for Business, Internal SSD Storage, and Network Attached Storage.

Table 3.2 List of WD Products








| No | Category | Product | Product Details |
|----|------------------|---|--|
| 1. | External Storage |  | Type : My Book for Mac Capacity : 2 TB – 8 TB |
| 2. | External Storage |  | Type : My Book Capacity : 2 TB – 8 TB |
| 3. | External Storage |  | Type : My Book Pro Capacity : 6 TB – 16 TB |
| 4. | External Storage |  | Type : My Book Duo Capacity : 4 TB – 16 TB |
| 5. | External Storage |  | Type : WD Elements Desktop Capacity : 2 TB – 4 TB |
| 6. | External Storage |  | Type : WD Book Capacity : 3 TB – 8 TB |
| 7. | Personal Cloud |  | Type : My Cloud Capacity : 2 TB – 8 TB |

Table 3.2. List of WD Product

| No | Category | Product | Product Details |
|-----|------------------|---|---|
| 8. | Personal Cloud |  | Type : My Cloud Mirror Capacity : 4 TB – 16 TB |
| 9. | Portable Storage |  | Type : My Passport Ultra Capacity : 1 TB – 4 TB |
| 10. | Portable Storage |  | Type : My Passport Wireless Capacity : 1 TB – 12 TB |
| 11. | Portable Storage |  | Type : My Passport Ultra Metal Capacity : 1 TB – 4 TB |
| 12. | Portable Storage |  | Type : My Passport for Mac Capacity : 1 TB – 3 TB |
| 13. | Portable Storage |  | Type : My Passport X Capacity : 1 TB – 3 TB |
| 14. | Portable Storage |  | Type : My Passport Pro Capacity : 2 TB – 4 TB |
| 15. | Portable Storage |  | Type : My Passport Wireless Pro Capacity : 1 TB – 4 TB |
| 16. | Portable Storage |  | Type : WD Elements Portable Capacity : 500 GB – 2 TB |

Table 3.2. List of WD Product

| No | Category | Product | Product Details |
|-----|---------------------|---|--|
| 17. | Portable Storage |  | Type : My Passport Capacity : 1 TB – 4 TB |
| 18. | Portable Storage |  | Type : My Passport For Mac Capacity : 1 TB – 4 TB |
| 19. | Portable Storage |  | Type : My Passport SSD Capacity : 256 GB – 1 TB |
| 20. | Internal HD Storage |  | Type : WD Red NAS HD Capacity : 750 GB – 10 TB |
| 21. | Internal HD Storage |  | Type : WD Blue PC Mobile HD Capacity : 320 GB – 2 TB |
| 22. | Internal HD Storage |  | Type : WD Black Mobile HD Capacity : 250 GB – 1 TB |
| 23. | Internal HD Storage |  | Type : WD Blue SSHD PC HD Capacity : 1 TB – 4 TB |
| 24. | Internal HD Storage |  | Type : WD Black Desktop HD Capacity : 500 GB – 6 TB |
| 25. | Internal HD Storage |  | Type : WD Blue PC Desktop HD Capacity : 500 GB – 6 TB |

Table 3.2. List of WD Product












| No | Category | Product | Product Details |
|-----|--------------------------|---|--|
| 26. | Internal HD Storage |  | Type : WD Purple Surveillance HD Capacity : 1 TB – 10 TB |
| 27. | Internal HD for business |  | Type : WD Gold Datacenter HD Capacity : 1 TB – 10 TB |
| 28. | Internal HD for business |  | Type : WD Purple NV Surveillance Capacity : 4 TB – 6 TB |
| 29. | Internal HD for business |  | Type : WD RE Datacenter HD Capacity : 250 GB – 500 GB |
| 30. | Internal HD for business |  | Type : WD Red Pro NAS HD Capacity : 2 TB – 10 TB |
| 31. | Internal SSD Storage |  | Type : WD Green PC SSD Capacity : 120 GB – 240 GB |
| 32. | Internal SSD Storage |  | Type : WD Blue PC SSD Capacity : 250 GB – 1 TB |
| 33. | Internal SSD Storage |  | Type : WD Black PCIe SSD Capacity : 256 GB – 1 TB |
| 34. | Network Attached Storage |  | Type : My Cloud Pro Series PR 2100 Capacity : 0 TB – 20 TB |

Table 3.2. List of WD Product

| No | Category | Product | Product Details |
|-----|--------------------------|---|---|
| 34. | Network Attached Storage |  | Type : My Cloud Pro Series PR 4100 Capacity : 0 TB – 40 TB |
| 34. | Network Attached Storage |  | Type : My Cloud EX 4100 Capacity : 0 TB – 32 TB |
| 35. | Network Attached Storage |  | Type : My Cloud Expertise Series EX 2 Ultra Capacity : 0 TB – 20 TB |

External storage has six products with capacity variants between 2 TB – 16 TB. Personal cloud has two products with capacity variants between 2 TB – 16 TB. Portable storage has ten products with capacity variants between 256 GB – 12 TB. Internal hard drive storage has seven products with capacity variants between 250 GB – 10 TB. Internal hard drive for business has four products with capacity variants between 250 GB – 10 TB. Internal SSD Storage has three products with capacity variants between 120 GB – 1 TB. Network Attached Storage has four products with capacity variants between 0 TB – 40 TB.

3.3. Production Process

Production process started with material coming. This process is handled by third parties. Then, materials processed in Clean Room and go to Back End. At the end, material will be shipped and this part also managed by third parties. General process can be shown in Figure 3.2

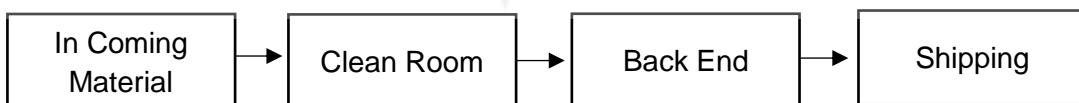


Figure 3.2 General Process of Production Process

After material received, it will go to clean room. All of assembly process occurred in this process. Part of hard drive can be shown in **Figure 3.3**

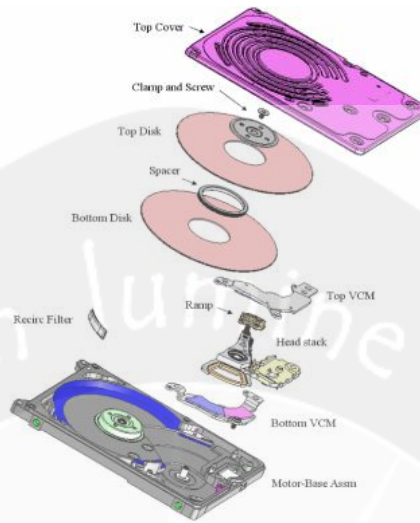


Figure 3.3 Part of Hard Drive

In the beginning, material will be washed in kiting out and kiting in. After everything is cleaned, it will be transferred to assembly line.

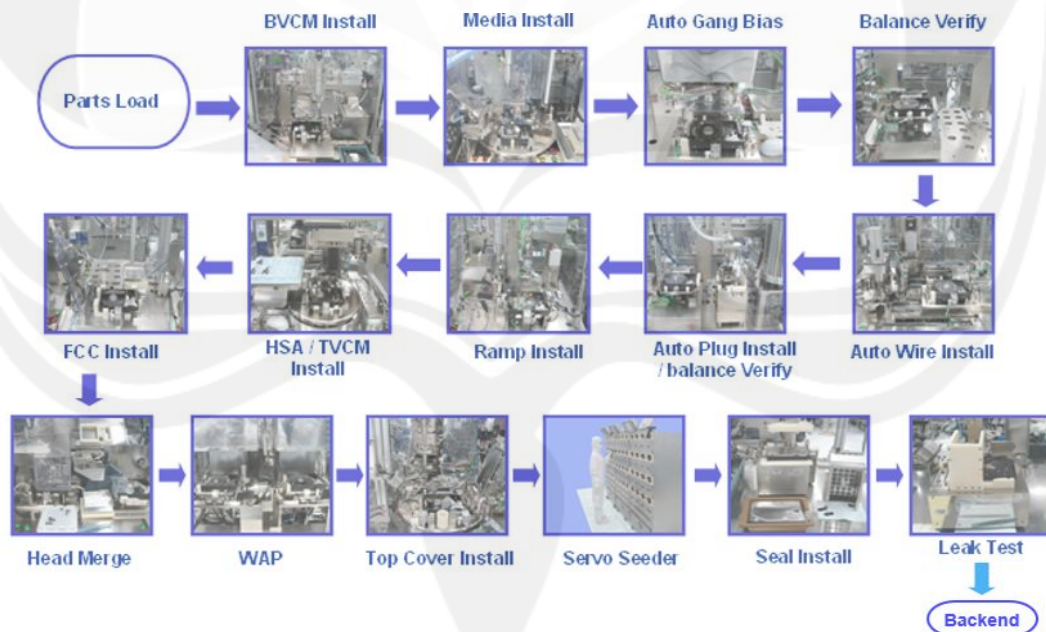


Figure 3.4 Assembly Process Flow

Parts that will be assembled are bottom VCM, media install, auto gang bias, FCC, Head Merge, and WAP. After all of that parts are assembled, it will be closed with top cover. After that it will added with servo seeder and seal install.

Clean room process ended with auto seal leak test. This test ensure each hard drive is not leaking and ready to be processed in back end.

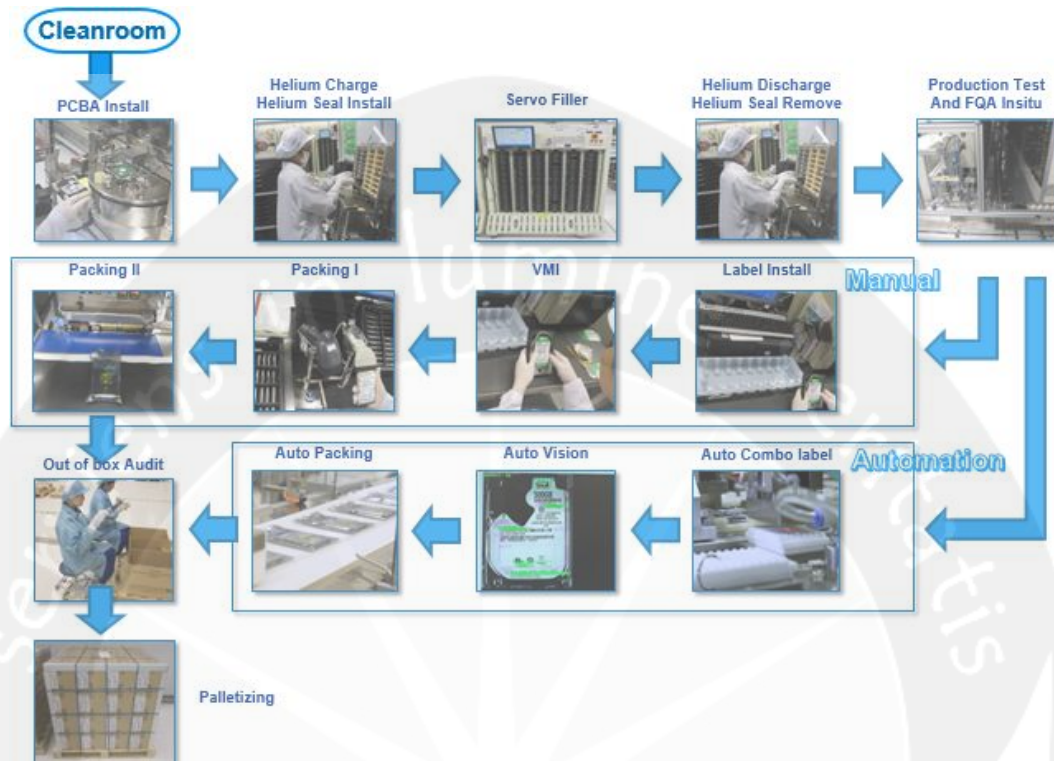


Figure 3.5 Back End Process Flow

The next process is Back End. This process is mostly related to test procedure, labelling, and packing. Back End started with PCBA process. After that it will goes to Helium Charge, X-Filler, and after that Helium Discharge. The next process is testing. When there's a failure related to products, it will be sent to debug team. Debug team will separate failure products based on the defect and send it back to the certain process. Products that passed from this test will be delivered to sorting process. The output of this process are grouped products based on customer. The next process is labelling and packing. This process is divided into automatic and manual. The automatic process called Back End Automation, and the manual process called Back End Streamline. After labelling and packing, the further process is palletizing. In this process there's also FQA as the last inspection. The reject products will deliver to debug team, while the passed products will deliver to the third parties for customer shipping.

3.4. Production Facility

Western Digital Thailand has two factory sites. The first factory is located in Industrial Estate Authority of Thailand at BangPa – In Industrial Park, Ayutthaya. There are 7 buildings in this site. Each building has different operation for manufacturing. The second factory is located in Navanakorn Industrial Park, Pathumtani. This site is used to manufacture Head Gimbal Assembly. This site was HGST factory before acquired by Western Digital. The building 1 and 2 that used for assembled wafer into HGA, tooling, with work hour 24 hours. Building 2 and 3 manufacturing HSA and HGA, Building 4 for manufacturing HDD and engineering labs. Building 6 also as place for manufacturing HDD, HGA, and HSA



CHAPTER 4

INTERNSHIP ASSIGNMENT

This chapter explained about assignment that given during internship, such as

- Assignment scope
- Rights and responsibilities
- Methodology to complete the assignment
- Result of internship assignment

4.1. Assignment Scope

Student had opportunity to work with Operation Planning Department. In the previous, this Department was called Industrial Engineer Department. This department was concerned on planning and improving the manufacturing process. Student had chance becoming the part of improvement team. This team had responsibility to do improvement in shop floor.

The assignment scope was in one of Back End process called Back End Automation (BEA). They have four machines and the layout can be shown in Figure 4.1.

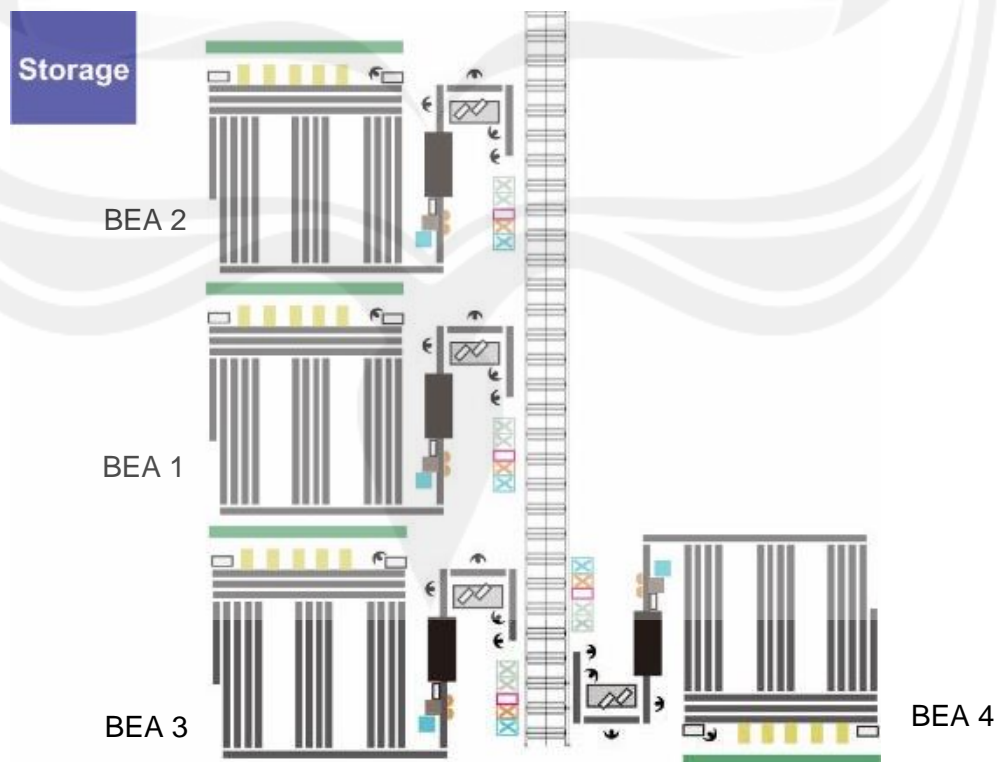


Figure 4.1. Back End Automation

The running of BEA machine based on demand. Usually they run all machine. But, if the demand is low, they only utilize BEA 1 and BEA 3. Back End Automation machine can be shown in Figure 4.2 and Figure 4.3



Figure 4.2. Back End Automation Machine

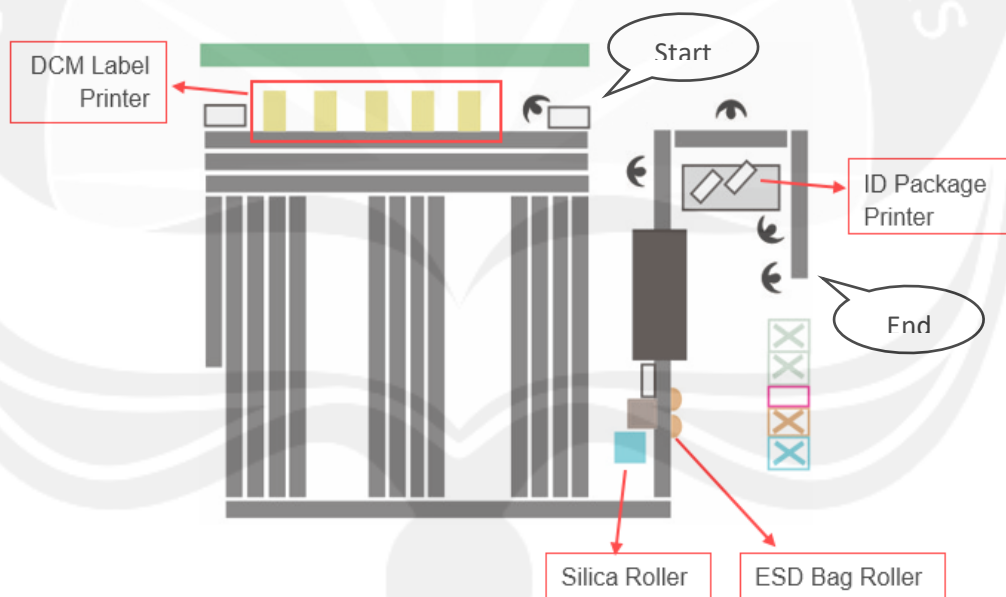


Figure 4.3. Back End Automation Machine Layout

This process is an automation process for hard drive labeling and packaging. Operator scan and load the hard drive, then it will automatically labelled. After labelled, the silica is added before packed with ESD Bag. Silica added and ESD packed also done automatically. After that, there are four operator for packing into cartons. Operator also give the sticker with barcode for customer's

identification in each carton. Each cartons consist of 20 hard drives. Besides operators, there are also technicians who responsible to make sure that there is no problem in machine, including indirect material availability; such as ESD bag, Silica, DCM label, ID package ribbon, and ID package label.

Based on data from engineering team on work week 40-43, the percentage of downtime is 25%. Downtime that caused by changing material contribute 10% from 25%. This was really high number since technician need to change materials in different time. The detail can be shown in Table 4.1.

Table 4.1. Frequency and Time Loss from Changing Material

| Indirect Material | Frequency / day | Downtime (sec/time) | Total Downtime (sec/time) |
|-----------------------------------|-----------------|---------------------|---------------------------|
| ESD Bag | 10 | 212 | 2120 |
| Silica | 10 | 27 | 270 |
| Package ID (ribbon) | 1 | 160 | 160 |
| Package ID (paper) | 1 | 48 | 48 |
| Total time (sec) loss/machine/day | | | 2598 |
| Total HDD loss/machine/day | | | 1299 |
| Total HDD loss/ 4 machine/day | | | 5196 |

Actually there are five materials that need to be changed by technicians. But, as the machine still running while changing DCM Label, they not consider it as downtime. Based on Table 4.1, total time loss each machine each day is 2598 seconds. The cycle time each Hard Disk Drive (HDD) is two seconds. So, the HDD loss each machine in one day is 1299 HDD. As there are 4 machine, the total HDD loss will be 5196 HDD.

Student as IE team works with Engineering and Tooling team for finding opportunities in order to reducing downtime in BEA caused by changing indirect materials.

4.2. Rights and Responsibilities

Here is right and responsibilities that given to Author

Rights given as following:

- a. Author permitted to enter all production room and learn about production process
- b. Author permitted to observe the manufacturing process and communicate with leader, supervisor, and operator
- c. Author permitted to take picture and video while manufacturing process

Responsibilities given as following:

- a. Author should conduct observation and find improvement opportunities of reducing downtime in Back End Automation caused by changing indirect material.
- b. Author should make weekly report and submit to mentor and team

4.3. Methodology to complete the assignment

Methodology used for finding improvement opportunity in Back End Automation is divided into project stage as shown in Figure 4.4

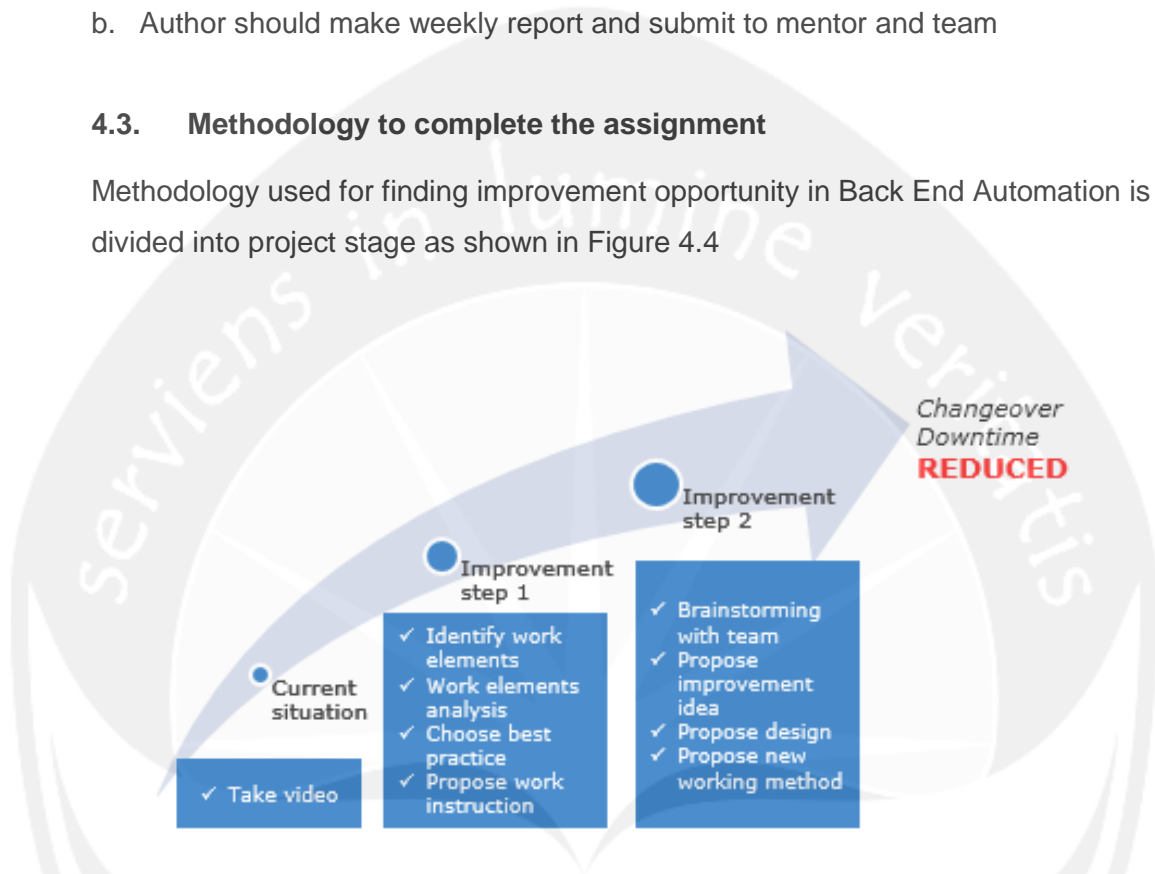


Figure 4.4. Project Stage

There are three stage of doing this project. The first one is based on current situation, then the second one is improvement step one, and the next is improvement step two.

a. Current situation

In this step, student doing observation and take video of technician while changing indirect materials such as ESD Bag, Silica, DCM Label, ID Package Ribbon and ID Package Label. Although changing DCM Label not needed machine to stop, it will be better if there is improvement for better ways of working. All sample is taken in BEA 3.

Each technician has their own style of changing materials. Some technician can do it really fast, while the other can't do as good as some technician. For

the changing procedure, engineering team already have it but only general procedure and don't have clear working instruction.

b. Improvement step 1

After all video taken, then student identify work elements. All video for changing materials was breakdown by activities and time. After that, each video will be compared and the shortest time is chosen as a best practice. Next, this best practice video will be analyze using one of Lean Technique called Single Minute Exchange Dies (SMED)

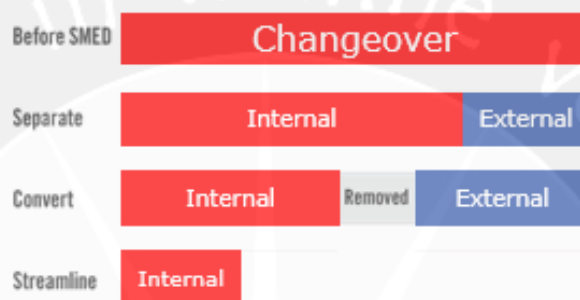


Figure 4.5. SMED Diagram

Refer to Figure 4.5., SMED technique is begin with separate internal and external activities. Internal is activities that done while the machine stops, and external is activities that can be done while the machine is still running. Then, removed non-value added activities from internal activities. If there is possible, streamline the internal activities to make changing time shorter.

The goal of improvement step 1 was developing work instruction for changing materials standardization among technicians. Then, work instruction delivered to technician by training with training package that already prepared by student.

c. Improvement step 2

After improvement step 1 was submitted, the next step is looking the others improvement opportunities in this area. First of all, method used was brainstorming with team for generating idea. As the time was limited, student only gave these ideas as suggestion and not implemented yet.

In this step, improvement was divided into two, such as suggestion phase one and suggestion phase two. Suggestion phase one was suggestion for Productivity and Workplace Improvement. This suggestion provide machine with visual alignment for easier materials changing.

The next suggestions is suggestions phase two. This idea was proposed for Ergonomic and further improvement. For ergonomic improvement, method used was assessing the technician's working posture using REBA (Rapid Entire Body Assessment) and RULA (Rapid Upper Limb Assessment). After got the score, student propose idea and did assessment for the new working method.

4.4. Result of Assignment

As there was two improvement step, the result of assignment also divided into two parts.

a. Improvement step 1:

The goal of this improvement was reducing changing indirect material downtime by making standardization among technicians. Student was comparing changing method between technicians, choose the best practice, and after that analyze using SMED technique.

Table 4.2. Result of Changing Material Time

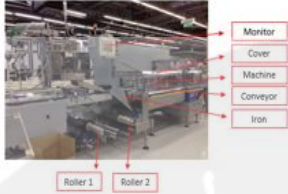
| | Before | | | After | | |
|-----------|----------|----------|-------|----------|----------|-------|
| | Internal | External | Total | Internal | External | Total |
| ESD Bag | 122 | 43 | 165 | 115 | 49 | 164 |
| Silica | 21 | 228 | 249 | 20 | 229 | 249 |
| Label ID | 53 | 10 | 63 | 43 | 2 | 45 |
| Ribbon ID | 160 | 18 | 178 | 159 | 1 | 160 |




Table 4.2 is a summary of changing time between best practice before and after analysis. The time unit is seconds. The detail of changing activities and each time can be shown in Appendix 1.

Student was using this changing method as a standard and made training package for engineering team. Here is the training package given:

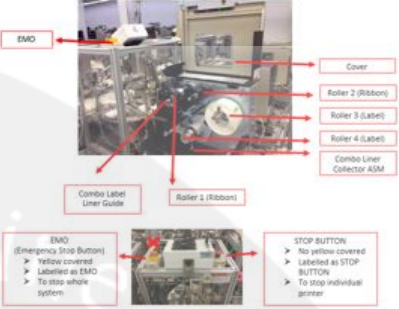
- Enhancing Back End Automation Working Instruction Documents
Working instruction document for changing ESD Bag, Silica, DCM Label, ID Package Ribbon and ID Package Label are enhanced to make it more detail and complete. Figure 4.6 below is the example of Working Instruction document. Complete document can be shown in Appendix 2.

11.8.4. Method to Change ESD Film



| No | Picture | Description |
|----|---|--|
| 1 |  | 1. Monitoring roller |
| 2 |  | 1. Set the machine in monitor 2. Press stop |
| 3 |  | 1. Cut ESD Plastic using cutter |

11.8.4. Printer Operating Procedure for Operators / Technicians





| No | Picture | Description |
|----|--|--|
| 1 |  | 1. Check on monitor to know which printer rawing out material. The small window will change from green to yellow |
| 2 |  | 1. Prepare the material 2. Press STOP button to stop the system 3. Open the cover |

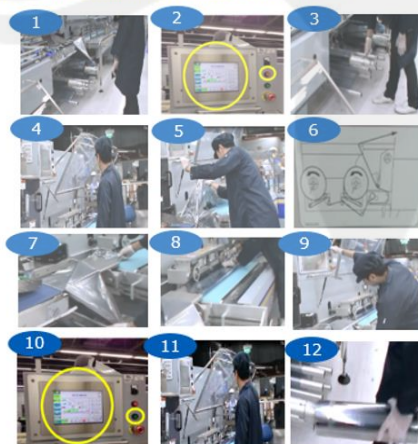
Figure 4.6 Example of Working Instruction Document

The machine and its part added for helping new technician know about the machine. Besides, there is also table consist of picture and explanation in each step. This documents already given to engineering team and become the revision for the previous document

Develop the Work Instruction

This document is almost same with the previous one, but this document is more informal and used as slide for training

Back End Automation Training Package



Changing ESD Bag

1. Monitoring roller
2. Set the machine and press stop
3. Cut ESD plastic
4. Open conveyor cover
5. Take out plastic and dispose it
6. Set the roller
7. Pull and fold plastic then placed in conveyor
8. Set plastic with machine
9. Right hand set alignment
Left hand set the roller
10. Set the machine and press green button to run
11. Close conveyor cover
12. Dispose the old roll, install and set the new one



Figure 4.7 Example of Slide for Working Instruction

Figure above shown the step of changing material. The picture located on left side while the written step located on right side. This documents also made for changing Silica, DCM Label, ID Package Ribbon, and ID Package Label. Complete document can be shown in Appendix 3.

- Provide best practice video for effective training
Best method video also provided for easier understanding and effective technician training



Figure 4.8 Example of Best Practice Video

In this occasion, the video only made for changing ESD Bag and Silica based on high changing frequency each day. This video not only used for training, but also shared to technician group on Line Messenger.

- Give illustration for easier understanding



Figure 4.9 Illustration for Changing ESD Bag

Illustration above identify the critical points and give comparison between Yes (true way) and No (wrong way). From all materials that need to be changed in Back End Automation, change ESD Bag take longest time among the others. The goal of this idea is helping technician to remember the important step of changing ESD Bag. This illustration already shared to technician group on Line Messenger.

b. Improvement step 2

The goal of this improvement was giving suggestion for company and it divided into Suggestion Phase 1 (Productivity and Workplace Improvement) and Suggestion Phase 2 (Ergonomic Improvement and Further Recommendation).

Here is the result of Suggestion Phase 1

- Visual alignment in machine

Student was proposing visual alignment for supporting standardization. There was four ideas proposed, such as give clear alignment for ESD placement, give sequence number in roller, give cutter near machine, and give important step near the machine. The improvement idea can be shown in Figure 4.10



Figure 4.10 Visual Alignment Proposed in BEA Machine

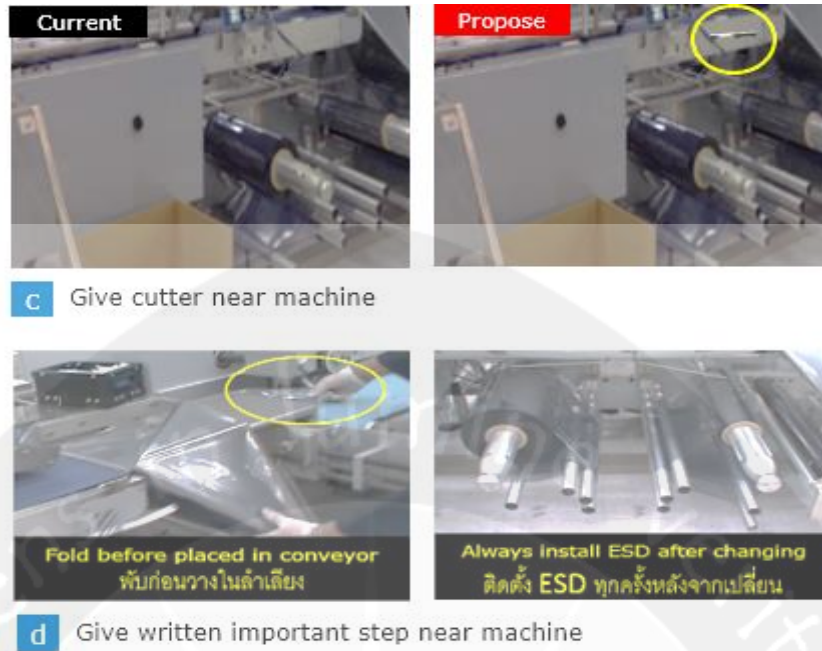


Figure 4.10 Visual Alignment Proposed in BEA Machine

Besides supporting standardization, hopefully this visual alignment can help new technician to learn by himself how to change ESD Bag based on standard.

- Workplace Improvement in Back End Automation Line
 - ✓ Determine standard workplace for ID Package area

Student observed ID Package area in Back End, then asked production team and sort the stuffs that should be available in each line. After that, student proposed the placement of each stuffs that shown on Figure 4.15



Figure 4.11 Current and Proposed ID Package Area

The main purpose of this idea is preventing non-value added activity to move accessories before and after changing materials. Besides, this workplace standardization will reminds all line to prepare materials (ribbon ID and label ID) near the printer.

- ✓ Change place for keep silica
Same as ID Package, student observed and discussed with production team to sort stuffs and set the placement of each stuffs

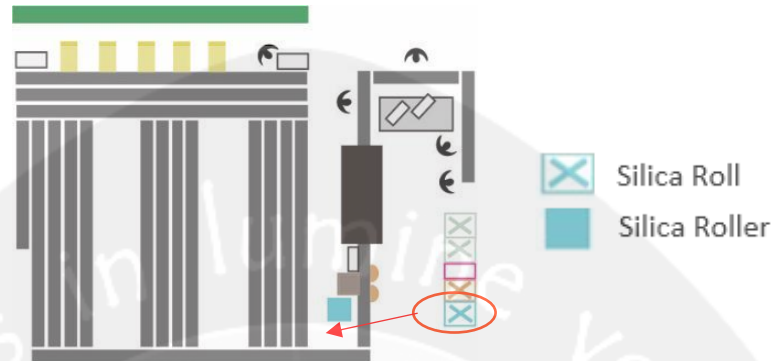


Figure 4.12 BEA Layout

In current situation, technician should transport the silica roll above the hard disk conveyor. We saw the waste of motion, time, and also risk of falling silica roll in conveyor. The proposed idea is move the silica place near the silica roller. It will minimize motion and the risk of falling silica roll in conveyor.

Here is the result of Suggestion Phase 2

- Visual sign to cut ESD
Currently, they already had signal for changing material. There's Andon for visual sign when the material need to be changed. But, after technician coming, there is no signal when technician should cut the ESD. They just cut based on their feeling.

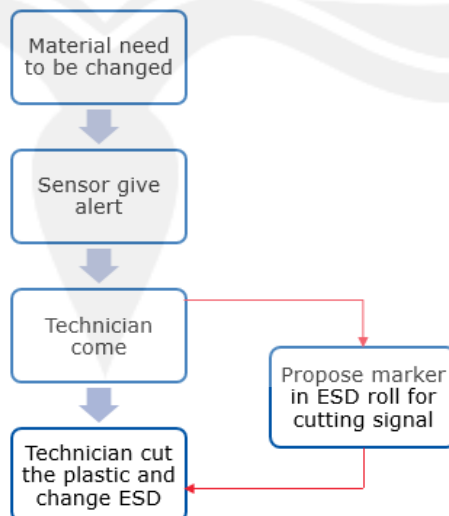


Figure 4.13 Current and Proposed Flow for Changing ESD

The proposed idea is give marker as a cutting signal for technician. The benefit of this marker is optimize material usage and support procedure standardization. Beside that one, the other improvement idea is change material after the marker (material that disposed) with the other material. As ESD Bag is expensive, if we can replace with the cheaper material it will minimize IDM cost.

- Modifying printer
 - ✓ Modify printer cover with transparent cover



Add acrylic glass to make it transparent

Figure 4.14 Proposed Printer Cover

Transparent cover will help operator knows the material availability without opening the printer. This idea will reduce non-value added activity for checking material availability.

- ✓ Provide slider in printer for ergonomic changing material

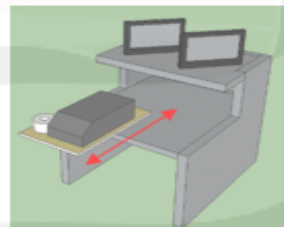


Figure 4.15 Current and Proposed Slider in Printer

Based on current situation, the score of arm and wrist analysis is 5. The score for neck, trunk, and leg analysis is 4. Therefore, based on table the final Rapid Upper Limb Assessment (RULA) score is 5 which means medium risk; further investigation, and need to change soon. The proposed idea is concerning ergonomic and preventing longer changing time caused by inconvenient changing position. With the slider, it can improve score become 3 which means low risk. The score of arm and wrist analysis can be decrease from 5 to 4. The score for neck, trunk, and leg analysis also decrease from 4 to 2. Therefore, based on table the final Rapid Upper Limb Assessment

(RULA) score is 3. The assessment can be shown in Appendix 4 and 5.

- Improve silica roller



Figure 4.16 Current and Proposed Silica Roller

In current situation, technician should lift the stick before change with the new silica roll. It will waste time because of unnecessary motion. The proposed idea is change the roller into the static one. Technician just push the silica and they don't need to lift the stick again. The benefit of this idea is minimize motion and easier for technician to change silica

- Material handling for ESD changing

Previously, each ESD roll has weight 19.5 kg. With the proposed capacity from tooling team, it becomes 24.1 kg.

Table 4.3. Comparison between types of ESD

| Indirect Material | Diameter | Weight | Length | HDD/Roll | Frequency / day |
|---------------------------|----------|---------|--------|----------|-----------------|
| ESD (current situation) | 23 cm | 19.5 kg | 500 m | 3000 | 10 |
| ESD (proposed by tooling) | 26 cm | 24.1 kg | 650 m | 3900 | 8 |

By increasing the capacity of each roll, the changing frequency will decrease from 10 times/day become 8 times/day. In the other hand, increasing capacity also lead heavier material. There is no material handling and technician need to lift ESD bag manually. Based on current situation, the score of neck, trunk, and leg analysis is 9. The score for arm and wrist analysis is 4. Therefore, based on table the final Rapid Entire Body Assessment (REBA) score is 10 which means high risk and need implement change.



Figure 4.17 Proposed Material Handling

Figure 4.17 is a material handling for moving ESD roll from storage near the machine to the roller. Technician only need to place this tool in front of the ESD roll, pick ESD roll using this tool, then move it to the roller. With material handling, we can improve REBA final score become 3 which means low risk. The score of neck, trunk, and leg analysis can be decrease from 9 to 4. The score for arm and wrist analysis also decrease from 4 to 1. Therefore, based on table the final Rapid Entire Body Assessment (REBA) score is 3. The assessment can be shown in Appendix 6 and 7

4.5. Evaluation

- a. Create standardization among technician can't be done only by one time training. Swap the team member can be an effective way for learning and applying standardization between technicians.
- b. If all technician following the procedure, it can reduce product loss as shown in Table 4.3.

Table 4.4. Comparison of Product Loss Caused by Changing Material

| Indirect Material | Frequency / day | Downtime Before | Downtime After | Total Downtime Before | Total Downtime After |
|-----------------------------------|-----------------|-----------------|----------------|-----------------------|----------------------|
| ESD Bag | 10 | 212 | 115 | 2120 | 1150 |
| Silica | 10 | 27 | 20 | 270 | 200 |
| Package ID (ribbon) | 1 | 160 | 159 | 160 | 159 |
| Package ID (paper) | 1 | 48 | 43 | 48 | 43 |
| Total time (sec) loss/machine/day | | | | 2598 | 1552 |
| Total HDD loss/machine/day | | | | 1299 | 776 |
| Total HDD loss/ 4 machine/day | | | | 5196 | 3104 |

Product loss each day caused by changing material can be reduced 59% from 5196 units become 3104 units.

CHAPTER 5 CONCLUSION

Here is the conclusion of this Internship Report

1. Internship duration was started on April and ended on August, 18 2017
2. The area of project was in Back End Automation
3. The project's goal was finding opportunities in order to reduce downtime in Back End Automation caused by changing indirect materials.
4. Method used on this assignment are lean technique (SMED) and ergonomic assessment (RULA and REBA)
5. There are two stage of doing this assignment; improvement step one and improvement step two
6. The result of improvement step 1 is providing training package for technician
7. The result of improvement step 2 are divided into two parts;
 - a. Suggestion Phase 1 (Suggestion for Productivity and Workplace Improvement)
 - b. Suggestion Phase 2 (Suggestion for Ergonomic and Further Recommendation)
8. Arrange cross functional meeting continuously is very effective action for generating continuous improvement.

Appendix 4. RULA of Changing ID Package (Before)



A. Arm and Wrist Analysis

Step 1: Locate Upper Arm Position:



Step 1a: Adjust...
If shoulder is raised: +1
If upper arm is abducted: +1
If arm is supported or person is leaning: +1

4
Upper Arm Score

Step 2: Locate Lower Arm Position:



Step 2a: Adjust...
If either arm is working across midline or out to side of body: Add +1

2
Lower Arm Score

Step 3: Locate Wrist Position:



Step 3a: Adjust...
If wrist is bent from midline: Add +1

1
Wrist Twist Score

Step 4: Wrist Twist:

If wrist is twisted in mid-range: +1
If wrist is at or near end of range: +2

2
Wrist Score

Step 5: Look-up Posture Score in Table A:

Using values from steps 1-4 above, locate score in Table A

4
Posture Score A

Step 6: Add Muscle Use Score

If posture mainly static (i.e. held > 10 minutes), Or if action repeated occurs 4X per minute: +1

1
Muscle Use Score

Step 7: Add Force/Load Score

If load < 4.4 lbs. (intermittent): +0
If load 4.4 to 22 lbs. (intermittent): +1
If load 4.4 to 22 lbs. (static or repeated): +2
If more than 22 lbs. or repeated or shocks: +3

0
Force / Load Score

Step 8: Find Row in Table C

Add values from steps 5-7 to obtain Wrist and Arm Score. Find row in Table C.

5
Wrist & Arm Score

| Table A | | Wrist Score | | | |
|-----------|-----------|---------------|---------------|---------------|---------------|
| Upper Arm | Lower Arm | Wrist Twist 1 | Wrist Twist 2 | Wrist Twist 3 | Wrist Twist 4 |
| 1 | 1 | 1 | 2 | 2 | 3 |
| 1 | 2 | 2 | 2 | 2 | 3 |
| 1 | 3 | 2 | 3 | 3 | 3 |
| 1 | 4 | 2 | 3 | 3 | 3 |
| 2 | 1 | 2 | 3 | 3 | 3 |
| 2 | 2 | 3 | 3 | 3 | 3 |
| 2 | 3 | 3 | 3 | 3 | 3 |
| 2 | 4 | 3 | 3 | 3 | 3 |
| 3 | 1 | 3 | 4 | 4 | 4 |
| 3 | 2 | 3 | 4 | 4 | 4 |
| 3 | 3 | 4 | 4 | 4 | 4 |
| 3 | 4 | 4 | 4 | 4 | 4 |
| 4 | 1 | 4 | 4 | 4 | 4 |
| 4 | 2 | 4 | 4 | 4 | 4 |
| 4 | 3 | 4 | 4 | 4 | 4 |
| 4 | 4 | 4 | 4 | 4 | 4 |
| 5 | 1 | 5 | 5 | 5 | 5 |
| 5 | 2 | 5 | 5 | 5 | 5 |
| 5 | 3 | 5 | 5 | 5 | 5 |
| 5 | 4 | 5 | 5 | 5 | 5 |
| 6 | 1 | 6 | 6 | 6 | 6 |
| 6 | 2 | 6 | 6 | 6 | 6 |
| 6 | 3 | 6 | 6 | 6 | 6 |
| 6 | 4 | 6 | 6 | 6 | 6 |

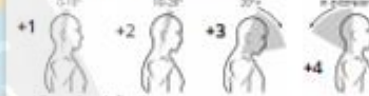
| Table C | | Neck, Trunk, Leg Score | | | | | |
|-------------------|-----------------|------------------------|---|---|---|---|---|
| Wrist / Arm Score | Posture Score A | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | 1 | 1 | 2 | 3 | 4 | 5 | 5 |
| 1 | 2 | 2 | 3 | 4 | 5 | 5 | 5 |
| 1 | 3 | 3 | 3 | 4 | 5 | 6 | 6 |
| 1 | 4 | 3 | 3 | 4 | 5 | 6 | 6 |
| 1 | 5 | 4 | 4 | 4 | 5 | 6 | 7 |
| 1 | 6 | 4 | 4 | 5 | 6 | 6 | 7 |
| 2 | 1 | 5 | 5 | 6 | 6 | 7 | 7 |
| 2 | 2 | 5 | 5 | 6 | 7 | 7 | 7 |
| 2 | 3 | 5 | 5 | 6 | 7 | 7 | 7 |
| 2 | 4 | 5 | 5 | 6 | 7 | 7 | 7 |
| 2 | 5 | 5 | 5 | 6 | 7 | 7 | 7 |
| 2 | 6 | 5 | 5 | 6 | 7 | 7 | 7 |

Scoring: (final score from Table C)
1-2 = acceptable posture
3-4 = further investigation, change may be needed
5-6 = further investigation, change soon
7 = investigate and implement change

5
RULA Score

B. Neck, Trunk and Leg Analysis

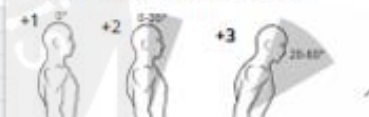
Step 9: Locate Neck Position:



Step 9a: Adjust...
If neck is twisted: +1
If neck is side bending: +1

2
Neck Score

Step 10: Locate Trunk Position:



Step 10a: Adjust...
If trunk is twisted: +1
If trunk is side bending: +1

3
Trunk Score

Step 11: Legs:

If legs and feet are supported: +1
If not: +2

1
Leg Score

| Neck Posture Score | Table B: Trunk Posture Score | | | | | |
|--------------------|------------------------------|--------|--------|--------|--------|--------|
| | Legs 1 | Legs 2 | Legs 3 | Legs 4 | Legs 5 | Legs 6 |
| 1 | 1 | 2 | 2 | 2 | 2 | 2 |
| 1 | 2 | 2 | 2 | 2 | 2 | 2 |
| 1 | 3 | 3 | 3 | 3 | 3 | 3 |
| 1 | 4 | 4 | 4 | 4 | 4 | 4 |
| 1 | 5 | 5 | 5 | 5 | 5 | 5 |
| 1 | 6 | 6 | 6 | 6 | 6 | 6 |
| 2 | 1 | 2 | 2 | 2 | 2 | 2 |
| 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 2 | 3 | 3 | 3 | 3 | 3 | 3 |
| 2 | 4 | 4 | 4 | 4 | 4 | 4 |
| 2 | 5 | 5 | 5 | 5 | 5 | 5 |
| 2 | 6 | 6 | 6 | 6 | 6 | 6 |
| 3 | 1 | 2 | 2 | 2 | 2 | 2 |
| 3 | 2 | 2 | 2 | 2 | 2 | 2 |
| 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 3 | 4 | 4 | 4 | 4 | 4 | 4 |
| 3 | 5 | 5 | 5 | 5 | 5 | 5 |
| 3 | 6 | 6 | 6 | 6 | 6 | 6 |
| 4 | 1 | 2 | 2 | 2 | 2 | 2 |
| 4 | 2 | 2 | 2 | 2 | 2 | 2 |
| 4 | 3 | 3 | 3 | 3 | 3 | 3 |
| 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| 4 | 5 | 5 | 5 | 5 | 5 | 5 |
| 4 | 6 | 6 | 6 | 6 | 6 | 6 |
| 5 | 1 | 2 | 2 | 2 | 2 | 2 |
| 5 | 2 | 2 | 2 | 2 | 2 | 2 |
| 5 | 3 | 3 | 3 | 3 | 3 | 3 |
| 5 | 4 | 4 | 4 | 4 | 4 | 4 |
| 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 5 | 6 | 6 | 6 | 6 | 6 | 6 |
| 6 | 1 | 2 | 2 | 2 | 2 | 2 |
| 6 | 2 | 2 | 2 | 2 | 2 | 2 |
| 6 | 3 | 3 | 3 | 3 | 3 | 3 |
| 6 | 4 | 4 | 4 | 4 | 4 | 4 |
| 6 | 5 | 5 | 5 | 5 | 5 | 5 |
| 6 | 6 | 6 | 6 | 6 | 6 | 6 |

Step 12: Look-up Posture Score in Table B:

Using values from steps 9-11 above, locate score in Table B

4
Posture B Score

Step 13: Add Muscle Use Score

If posture mainly static (i.e. held > 10 minutes), Or if action repeated occurs 4X per minute: +1

0
Muscle Use Score

Step 14: Add Force/Load Score

If load < 4.4 lbs. (intermittent): +0
If load 4.4 to 22 lbs. (intermittent): +1
If load 4.4 to 22 lbs. (static or repeated): +2
If more than 22 lbs. or repeated or shocks: +3

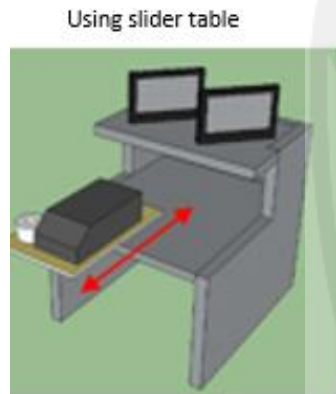
0
Force / Load Score

Step 15: Find Column in Table C

Add values from steps 12-14 to obtain Neck, Trunk and Leg Score. Find Column in Table C.

4
Neck, Trunk, Leg Score

Appendix 5. RULA of Changing ID Package (After)



A. Arm and Wrist Analysis

Step 1: Locate Upper Arm Position:



Step 1a: Adjust...
If shoulder is raised: +1
If upper arm is abducted: +1
If arm is supported or person is leaning: +1

2
Upper Arm Score

Step 2: Locate Lower Arm Position:



1
Lower Arm Score

Step 2a: Adjust...
If either arm is working across midline or out to side of body: Add +1

Step 3: Locate Wrist Position:



1 2
Wrist Twist Score Wrist Score

Step 3a: Adjust...
If wrist is bent from midline: Add +1

Step 4: Wrist Twist:
If wrist is twisted in mid-range: +1
If wrist is at or near end of range: +2

Step 5: Look-up Posture Score in Table A:
Using values from steps 1-4 above, locate score in Table A

3
Posture Score A

Step 6: Add Muscle Use Score
If posture mainly static (i.e. held >10 minutes),
Or if action repeated occurs 4X per minute: +1

1
Muscle Use Score

Step 7: Add Force/Load Score
If load < 4.4 lbs. (intermittent): +0
If load 4.4 to 22 lbs. (intermittent): +1
If load 4.4 to 22 lbs. (static or repeated): +2
If more than 22 lbs. or repeated or shocks: +3

0
Force / Load Score

Step 8: Find Row in Table C
Add values from steps 5-7 to obtain
Wrist and Arm Score. Find row in Table C.

4
Wrist & Arm Score

| | | Scores | | | | | | | |
|-----------|-------------|-------------|---|---|---|---|---|---|---|
| | | Wrist Score | | | | | | | |
| Table A | | 1 | 2 | 3 | 4 | | | | |
| Upper Arm | Lower Arm | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 2 |
| | Wrist Twist | 1 | 2 | 2 | 2 | 2 | 3 | 3 | 3 |
| 1 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 |
| | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 4 | 4 |
| 2 | 1 | 2 | 3 | 3 | 3 | 3 | 3 | 4 | 4 |
| | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 4 | 4 |
| 3 | 1 | 3 | 3 | 4 | 4 | 4 | 4 | 5 | 5 |
| | 2 | 2 | 3 | 4 | 4 | 4 | 4 | 4 | 5 |
| 4 | 1 | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 5 |
| | 2 | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 5 |
| 5 | 1 | 5 | 5 | 5 | 5 | 6 | 6 | 6 | 6 |
| | 2 | 5 | 5 | 6 | 6 | 6 | 6 | 7 | 7 |
| 6 | 1 | 6 | 6 | 6 | 6 | 7 | 7 | 7 | 7 |
| | 2 | 7 | 7 | 7 | 7 | 8 | 8 | 8 | 8 |
| 3 | 8 | 8 | 8 | 8 | 8 | 8 | 9 | 9 | |
| 3 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | |

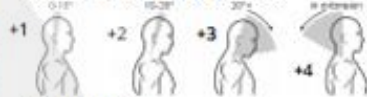
| | | Table C | | | | | | |
|-----------|-------------|------------------------|---|---|---|---|---|----|
| | | Neck, Trunk, Leg Score | | | | | | |
| Table C | | 1 | 2 | 3 | 4 | 5 | 6 | 7+ |
| Upper Arm | Lower Arm | 1 | 1 | 2 | 3 | 3 | 4 | 5 |
| | Wrist Twist | 2 | 2 | 2 | 3 | 4 | 4 | 5 |
| 1 | 2 | 3 | 3 | 3 | 3 | 4 | 4 | 5 |
| | 3 | 3 | 3 | 3 | 4 | 4 | 5 | 6 |
| 2 | 1 | 4 | 3 | 3 | 3 | 4 | 5 | 6 |
| | 2 | 4 | 4 | 4 | 4 | 5 | 6 | 7 |
| 3 | 1 | 5 | 4 | 4 | 4 | 5 | 6 | 7 |
| | 2 | 5 | 5 | 5 | 5 | 6 | 7 | 7 |
| 4 | 1 | 6 | 4 | 4 | 4 | 5 | 6 | 7 |
| | 2 | 6 | 4 | 4 | 4 | 5 | 6 | 7 |
| 5 | 1 | 7 | 5 | 5 | 5 | 6 | 7 | 7 |
| | 2 | 7 | 5 | 5 | 6 | 6 | 7 | 7 |
| 6 | 1 | 8 | 5 | 5 | 6 | 7 | 7 | 7 |
| | 2 | 8 | 5 | 5 | 6 | 7 | 7 | 7 |

Scoring: (final score from Table C)
1-2 = acceptable posture
3-4 = further investigation, change may be needed
5-6 = further investigation, change soon
7 = investigate and implement change

3
RULA Score

B. Neck, Trunk and Leg Analysis

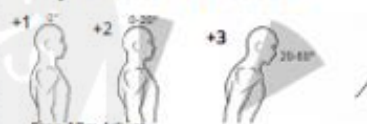
Step 9: Locate Neck Position:



Step 9a: Adjust...
If neck is twisted: +1
If neck is side bending: +1

2
Neck Score

Step 10: Locate Trunk Position:



Step 10a: Adjust...
If trunk is twisted: +1
If trunk is side bending: +1

2
Trunk Score

Step 11: Legs:
If legs and feet are supported: +1
If not: +2

1
Leg Score

| Neck Posture Score | Table B: Trunk Posture Score | | | | | |
|--------------------|------------------------------|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | 1 | 2 | 1 | 2 | 1 | 2 |
| 2 | 1 | 2 | 1 | 2 | 1 | 2 |
| 3 | 1 | 2 | 1 | 2 | 1 | 2 |
| 4 | 1 | 2 | 1 | 2 | 1 | 2 |
| 5 | 1 | 2 | 1 | 2 | 1 | 2 |
| 6 | 1 | 2 | 1 | 2 | 1 | 2 |

Step 12: Look-up Posture Score in Table B:
Using values from steps 9-11 above,
locate score in Table B

2
Posture B Score

Step 13: Add Muscle Use Score
If posture mainly static (i.e. held >10 minutes),
Or if action repeated occurs 4X per minute: +1

0
Muscle Use Score

Step 14: Add Force/Load Score
If load < 4.4 lbs. (intermittent): +0
If load 4.4 to 22 lbs. (intermittent): +1
If load 4.4 to 22 lbs. (static or repeated): +2
If more than 22 lbs. or repeated or shocks: +3

0
Force / Load Score

Step 15: Find Column in Table C
Add values from steps 12-14 to obtain
Neck, Trunk and Leg Score. Find Column in Table C.

2
Neck, Trunk, Leg Score

Appendix 6. REBA of Material Handling (Before)

A. Neck, Trunk and Leg Analysis

Step 1: Locate Neck Position



Step 1a: Adjust...
If neck is twisted: +1
If neck is side bending: +1

2
Neck Score

Step 2: Locate Trunk Position



Step 2a: Adjust...
If trunk is twisted: +1
If trunk is side bending: +1

4
Trunk Score

Step 3: Legs



3
Leg Score

Step 4: Look-up Posture Score in Table A

Using values from steps 1-3 above, Locate score in Table A

7
Posture Score A

Step 5: Add Force/Load Score

If load < 11 lbs.: +0
If load 11 to 22 lbs.: +1
If load > 22 lbs.: +2
Adjust: If shock or rapid build up of force: add +1

2
Force / Load Score

Step 6: Score A, Find Row in Table C

Add values from steps 4 & 5 to obtain Score A, Find Row in Table C.

9
Score A

Scoring

- 1 = Negligible Risk
- 2-3 = Low Risk. Change may be needed.
- 4-7 = Medium Risk. Further Investigate. Change Soon.
- 8-10 = High Risk. Investigate and Implement Change
- 11+ = Very High Risk. Implement Change

Scores

| Table A | | Neck | | | | | | | | | | | |
|---------|---|------|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | | | | 2 | | | | 3 | | | |
| Legs | | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| Trunk | 1 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 3 | 3 | 5 | 6 |
| Posture | 2 | 2 | 3 | 4 | 5 | 3 | 4 | 5 | 6 | 4 | 5 | 6 | 7 |
| Score | 3 | 2 | 4 | 5 | 6 | 4 | 5 | 6 | 7 | 5 | 6 | 7 | 8 |
| | 4 | 3 | 5 | 6 | 7 | 5 | 6 | 7 | 8 | 6 | 7 | 8 | 9 |
| | 5 | 4 | 6 | 7 | 8 | 6 | 7 | 8 | 9 | 7 | 8 | 9 | 9 |

| Table B | | Lower Arm | | | | | |
|-----------|---|-----------|---|---|---|---|---|
| | | 1 | | | 2 | | |
| Wrist | | 1 | 2 | 3 | 1 | 2 | 3 |
| Upper Arm | 1 | 1 | 2 | 2 | 1 | 2 | 3 |
| | 2 | 1 | 2 | 3 | 2 | 3 | 4 |
| | 3 | 3 | 4 | 5 | 4 | 5 | 5 |
| | 4 | 4 | 5 | 5 | 6 | 7 | 7 |
| | 5 | 6 | 7 | 8 | 7 | 8 | 8 |
| | 6 | 7 | 8 | 8 | 9 | 9 | 9 |

| Score A | Table C | | | | | | | | | | | |
|---------|---------|----|----|----|----|----|----|----|----|----|----|----|
| | Score B | | | | | | | | | | | |
| 1 | 1 | 1 | 1 | 2 | 3 | 3 | 4 | 5 | 6 | 7 | 7 | 7 |
| 2 | 1 | 2 | 2 | 3 | 4 | 4 | 5 | 6 | 6 | 7 | 7 | 8 |
| 3 | 2 | 3 | 3 | 3 | 4 | 5 | 6 | 7 | 7 | 8 | 8 | 8 |
| 4 | 3 | 4 | 4 | 4 | 5 | 6 | 7 | 8 | 8 | 9 | 9 | 9 |
| 5 | 4 | 4 | 4 | 5 | 6 | 7 | 8 | 8 | 9 | 9 | 9 | 9 |
| 6 | 6 | 6 | 6 | 7 | 8 | 8 | 9 | 9 | 10 | 10 | 10 | 10 |
| 7 | 7 | 7 | 7 | 8 | 9 | 9 | 9 | 10 | 10 | 11 | 11 | 11 |
| 8 | 8 | 8 | 8 | 9 | 10 | 10 | 10 | 10 | 10 | 11 | 11 | 11 |
| 9 | 9 | 9 | 9 | 10 | 10 | 10 | 11 | 11 | 11 | 12 | 12 | 12 |
| 10 | 10 | 10 | 10 | 11 | 11 | 11 | 11 | 12 | 12 | 12 | 12 | 12 |
| 11 | 11 | 11 | 11 | 11 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |

10 + 0 = 10
Table C Score Activity Score REBA Score

B. Arm and Wrist Analysis

Step 7: Locate Upper Arm Position:



Step 7a: Adjust...
If shoulder is raised: +1
If upper arm is abducted: +1
If arm is supported or person is leaning: -1

2
Upper Arm Score

Step 8: Locate Lower Arm Position:



2
Lower Arm Score

Step 9: Locate Wrist Position:



2
Wrist Score

Step 9a: Adjust...
If wrist is bent from midline or twisted: Add +1

Step 10: Look-up Posture Score in Table B

Using values from steps 7-9 above, locate score in Table B

3
Posture Score B

Step 11: Add Coupling Score

Well fitting Handle and mid range power grip, **good: +0**
Acceptable but not ideal hand hold or coupling acceptable with another body part, **fair: +1**
Hand hold not acceptable but possible, **poor: +2**
No handles, awkward, unsafe with any body part, **Unacceptable: +3**

1
Coupling Score

Step 12: Score B, Find Column in Table C

Add values from steps 10 & 11 to obtain Score B. Find column in Table C and match with Score A in row from step 6 to obtain Table C Score.

4
Score B

Step 13: Activity Score

+1 1 or more body parts are held for longer than 1 minute (static)
+1 Repeated small range actions (more than 4x per minute)
+1 Action causes rapid large range changes in postures or unstable base



Appendix 7. REBA of Material Handling (After)

A. Neck, Trunk and Leg Analysis

Step 1: Locate Neck Position



Step 1a: Adjust...
If neck is twisted: +1
If neck is side bending: +1

1
Neck Score

Step 2: Locate Trunk Position



Step 2a: Adjust...
If trunk is twisted: +1
If trunk is side bending: +1

2
Trunk Score

Step 3: Legs



1
Leg Score

Step 4: Look-up Posture Score in Table A

Using values from steps 1-3 above, Locate score in Table A

2
Posture Score A

Step 5: Add Force/Load Score

If load < 11 lbs.: +0
If load 11 to 22 lbs.: +1
If load > 22 lbs.: +2

2
Force / Load Score

Step 6: Score A, Find Row in Table C

Add values from steps 4 & 5 to obtain Score A. Find Row in Table C.

4
Score A

Scoring

- 1 = Negligible Risk
- 2-3 = Low Risk. Change may be needed.
- 4-7 = Medium Risk. Further Investigate. Change Soon.
- 8-10 = High Risk. Investigate and Implement Change
- 11+ = Very High Risk. Implement Change

Scores

| Table A | | Neck | | | | | | | | | | | |
|---------|---|------|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | | | | 2 | | | | 3 | | | |
| Legs | | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| Trunk | 1 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 3 | 3 | 5 | 6 |
| Posture | 2 | 2 | 3 | 4 | 5 | 3 | 4 | 5 | 6 | 4 | 5 | 6 | 7 |
| Score | 3 | 2 | 4 | 5 | 6 | 4 | 5 | 6 | 7 | 5 | 6 | 7 | 8 |
| | 4 | 3 | 5 | 6 | 7 | 5 | 6 | 7 | 8 | 6 | 7 | 8 | 9 |
| | 5 | 4 | 6 | 7 | 8 | 6 | 7 | 8 | 9 | 7 | 8 | 9 | 9 |

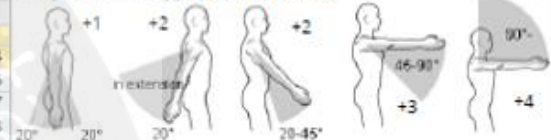
| Table B | | Lower Arm | | | | | |
|-----------|---|-----------|---|---|---|---|---|
| | | 1 | | | 2 | | |
| Wrist | | 1 | 2 | 3 | 1 | 2 | 3 |
| Upper Arm | 1 | 1 | 2 | 2 | 1 | 2 | 3 |
| | 2 | 1 | 2 | 3 | 2 | 3 | 4 |
| | 3 | 3 | 4 | 5 | 4 | 5 | 5 |
| | 4 | 4 | 5 | 5 | 6 | 7 | |
| | 5 | 6 | 7 | 8 | 7 | 8 | |
| | 6 | 7 | 8 | 8 | 8 | 9 | |

| Score A | Table C | | | | | | | | | | | |
|---------|---------|----|----|----|----|----|----|----|----|----|----|----|
| | Score B | | | | | | | | | | | |
| 1 | 1 | 1 | 1 | 2 | 3 | 3 | 4 | 5 | 6 | 7 | 7 | 7 |
| 2 | 1 | 2 | 2 | 3 | 4 | 4 | 5 | 6 | 6 | 7 | 7 | 8 |
| 3 | 2 | 3 | 3 | 3 | 4 | 5 | 6 | 7 | 7 | 8 | 8 | 8 |
| 4 | 3 | 4 | 4 | 4 | 5 | 6 | 7 | 8 | 8 | 9 | 9 | 9 |
| 5 | 4 | 4 | 4 | 5 | 6 | 7 | 8 | 8 | 9 | 9 | 9 | 9 |
| 6 | 6 | 6 | 6 | 7 | 8 | 8 | 9 | 9 | 10 | 10 | 10 | 10 |
| 7 | 7 | 7 | 7 | 8 | 9 | 9 | 9 | 10 | 10 | 11 | 11 | 11 |
| 8 | 8 | 8 | 8 | 9 | 10 | 10 | 10 | 10 | 11 | 11 | 11 | 11 |
| 9 | 9 | 9 | 9 | 10 | 10 | 11 | 11 | 11 | 12 | 12 | 12 | 12 |
| 10 | 10 | 10 | 10 | 11 | 11 | 11 | 12 | 12 | 12 | 12 | 12 | 12 |
| 11 | 11 | 11 | 11 | 11 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |

3 + 0 = 3
Table C Score Activity Score REBA Score

B. Arm and Wrist Analysis

Step 7: Locate Upper Arm Position:



Step 7a: Adjust...
If shoulder is raised: +1
If upper arm is abducted: +1
If arm is supported or person is leaning: -1

1
Upper Arm Score

Step 8: Locate Lower Arm Position:



1
Lower Arm Score

Step 9: Locate Wrist Position:



1
Wrist Score

Step 9a: Adjust...
If wrist is bent from midline or twisted: Add +1

Step 10: Look-up Posture Score in Table B

Using values from steps 7-9 above, locate score in Table B

1
Posture Score B

Step 11: Add Coupling Score

Well fitting Handle and mid rang power grip, **good: +0**
Acceptable but not ideal hand hold or coupling acceptable with another body part, **fair: +1**
Hand hold not acceptable but possible, **poor: +2**
No handles, awkward, unsafe with any body part, **Unacceptable: +3**

0
Coupling Score

Step 12: Score B, Find Column in Table C

Add values from steps 10 & 11 to obtain Score B. Find column in Table C and match with Score A in row from step 6 to obtain Table C Score.

1
Score B

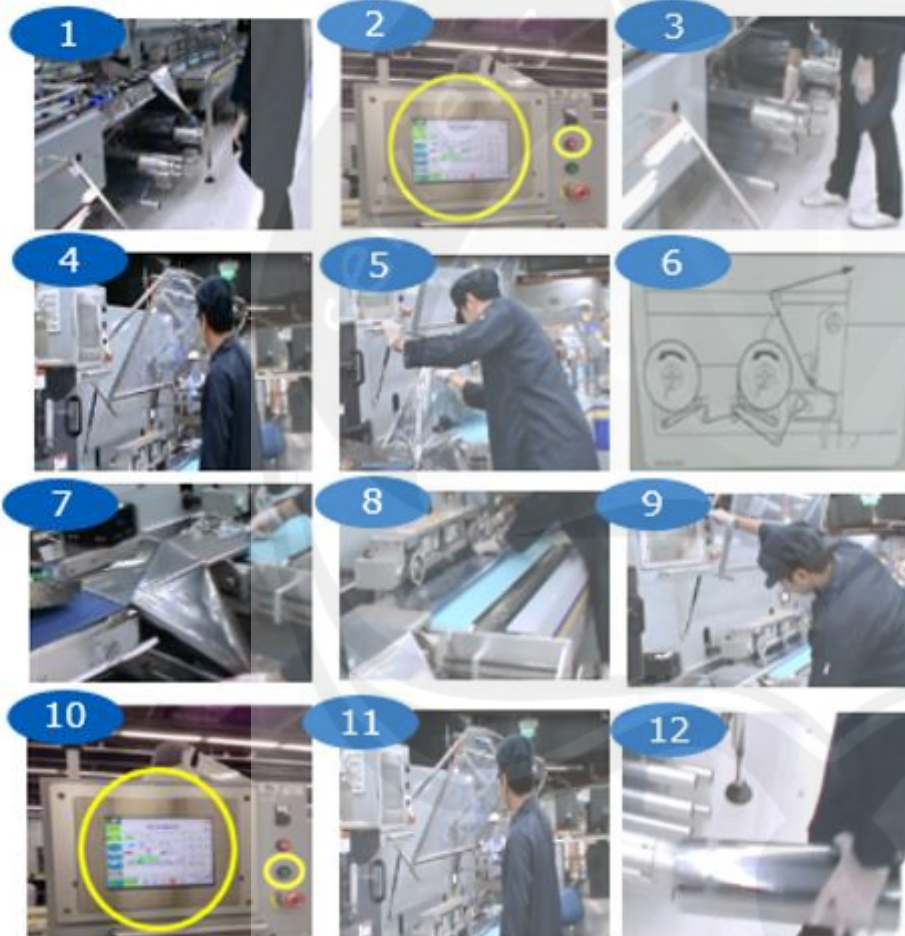
Step 13: Activity Score

+1 1 or more body parts are held for longer than 1 minute (static)
+1 Repeated small range actions (more than 4x per minute)
+1 Action causes rapid large range changes in postures or unstable base



Appendix 3. Work Instruction Slide

Back End Automation Training Package



Changing ESD Bag

1. Monitoring roller
2. Set the machine and press stop
3. Cut ESD plastic
4. Open conveyor cover
5. Take out plastic and dispose it
6. Set the roller
7. Pull and fold plastic then placed in conveyor
8. Set plastic with machine
9. Right hand set alignment
Left hand set the roller
10. Set the machine and press green button to run
11. Close conveyor cover
12. Dispose the old roll, install and set the new one



Appendix 3. Work Instruction Slide

Back End Automation Training Package



Changing Silica Gel

1. Pull out the silica, then open the tape from silica roll
2. Remove the old silica roll
3. Take the new roll and placed it
4. Open the tape from new roll and join it with the new roll
5. Go to the other side, and monitoring the alert in monitor
6. Open the cover and cut the taped silica
Put the cut silica in box
7. Pull the silica and place the new silica inside
8. Press blue button for reset, then black button to run the silica, and after it runs well, press white button to stop it
9. Press green button on monitor to run the machine
10. Put the silica piece in the HDD which not have silica yet
11. Close the cover

Appendix 1. Changing materials before and after

Changing ESD Bag

| Before | | | | After | | | |
|--------|---|----------|----------|-------|---|----------|----------|
| No | Activities | Internal | External | No | Activities | Internal | External |
| 1 | Press red button | | 1 | 1 | Press red button | | 1 |
| 2 | Set the machine in monitor | 3 | | 2 | Set the machine in monitor | 3 | |
| 3 | Press the green button | | 1 | 3 | Press the green button | | 1 |
| 4 | Waiting and monitoring | | 32 | 4 | Waiting and monitoring | | 32 |
| 5 | Cut the plastic | 2 | | 5 | Cut the plastic | 2 | |
| 6 | Set the machine in monitor | 1 | | 6 | Set the machine in monitor | 1 | |
| 7 | Open the conveyor cover | 3 | | 7 | Open the conveyor cover | | 3 |
| 8 | Return the cutter in pocket | 1 | | 8 | Return the cutter in pocket | | |
| 9 | Set the machine in monitor | 1 | | 9 | Set the machine in monitor | 1 | |
| 10 | Take out the ESD plastic in conveyor | 5 | | 10 | Take out the ESD plastic in conveyor | 5 | |
| 11 | Put ESD plastic and back to the position | 4 | | 11 | Put ESD plastic and back to the position | 4 | |
| 12 | Rotate ESD roller | 1 | | 12 | Rotate ESD roller | 1 | |
| 13 | Set ESD roller | 35 | | 13 | Set ESD roller | 35 | |
| 14 | Pull out ESD paper | 3 | | 14 | Pull out ESD paper | 3 | |
| 15 | Place & fold plastic in the iron before conveyor | 5 | | 15 | Place & fold plastic in the iron before conveyor | 5 | |
| 16 | LH rotate ESD roller RH pull the folded plastic in conveyor | 7 | | 16 | LH rotate ESD roller RH pull the folded plastic in conveyor | 7 | |
| 17 | Place the plastic in conveyor and set with the machine | 15 | | 17 | Place the plastic in conveyor and set with the machine | 15 | |
| 18 | Set the machine in monitor | 2 | | 18 | Set the machine in monitor | 2 | |
| 19 | Fix the roller position | 3 | | 19 | Fix the roller position | 3 | |
| 20 | Set the machine in monitor | 1 | | 20 | Set the machine in monitor | 1 | |
| 21 | Fix the roller position | 3 | | 21 | Fix the roller position | 3 | |
| 22 | Close the conveyor cover | 3 | | 22 | Close the conveyor cover | | 3 |
| 23 | Set the machine in monitor | 2 | | 23 | Set the machine in monitor | 2 | |
| 24 | Fix the plastic position in the iron | 3 | | 24 | Fix the plastic position in the iron | 3 | |
| 25 | Rotate ESD roller | 3 | | 25 | Rotate ESD roller | 3 | |
| 26 | Fix the plastic position in the iron | 2 | | 26 | Fix the plastic position in the iron | 2 | |
| 27 | Rotate ESD roller | 2 | | 27 | Rotate ESD roller | 2 | |
| 28 | Fix the plastic position in the iron | 7 | | 28 | Fix the plastic position in the iron | 7 | |
| 29 | Set the machine in monitor | 5 | | 29 | Set the machine in monitor | 5 | |
| 30 | Fix the plastic position in the iron | | 1 | 30 | Fix the plastic position in the iron | | 1 |
| 31 | Take out the old ESD plastic from the roller | | 1 | 31 | Take out the old ESD plastic from the roller | | 1 |
| 32 | Place the old one | | 3 | 32 | Place the old one | | 3 |
| 33 | Throw away ESD plastic in trash bag | | 4 | 33 | Throw away ESD plastic in trash bag | | 4 |
| Total | | 122 | 43 | Total | | 115 | 49 |

Changing Silica

| Before | | | | After | | | |
|--------|--|----------|----------|-------|--|----------|----------|
| No | Activities | Internal | External | No | Activities | Internal | External |
| 1 | Pull out the silica | | 11 | 1 | Pull out the silica | | 11 |
| 2 | Remove the empty roll | | 3 | 2 | Remove the empty roll | | 3 |
| 3 | Change with new roll | | 3 | 3 | Change with new roll | | 3 |
| 4 | Place the new silica roll | | 5 | 4 | Place the new silica roll | | 5 |
| 5 | Open the tape | | 3 | 5 | Open the tape | | 3 |
| 6 | Taped the previous silica with the new one | | 33 | 6 | Taped the previous silica with the new one | | 33 |
| 7 | Set the silica roll | | 6 | 7 | Set the silica roll | | 6 |
| 8 | Move the empty roll | | 8 | 8 | Move the empty roll | | 8 |
| 9 | Close the cover | | 2 | 9 | Close the cover | | 2 |
| 10 | Waiting and monitoring | | 152 | 10 | Waiting and monitoring | | 152 |
| 11 | Open the machine cover | | 2 | 11 | Open the machine cover | | 2 |
| 12 | Cut the taped silica | 12 | | 12 | Cut the taped silica | 12 | |
| 13 | Set the machine | 7 | | 13 | Set the machine | 7 | |
| 14 | Close the machine cover | 1 | | 14 | Close the machine cover | | 1 |
| 15 | Press green button in monitor | 1 | | 15 | Press green button in monitor | 1 | |
| Total | | 21 | 228 | Total | | 20 | 229 |

Changing Label ID

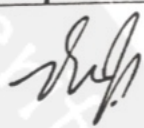
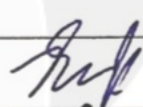
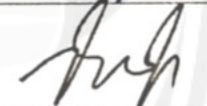
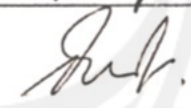
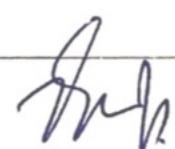
| Before | | | | After | | | |
|--------|--|----------|----------|-------|--|----------|----------|
| No | Activities | Internal | External | No | Activities | Internal | External |
| 1 | Set the place | | 9 | 1 | Set the place | | |
| 2 | Open the cover | | 1 | 2 | Open the cover | | 1 |
| 3 | Push up the knob | 2 | | 3 | Push up the knob | 2 | |
| 4 | Remove the label roll | 6 | | 4 | Remove the label roll | 6 | |
| 5 | Throw the old label | 3 | | 5 | Throw the old label | 3 | |
| 6 | Put the old roll | 1 | | 6 | Put the old roll | 1 | |
| 7 | Take the new label roll | 1 | | 7 | Take the new label roll | 1 | |
| 8 | Rotate the label roll | 2 | | 8 | Rotate the label roll | 2 | |
| 9 | Install the new roll | 4 | | 9 | Install the new roll | 4 | |
| 10 | Pull out the paper and set the machine | 12 | | 10 | Pull out the paper and set the machine | 12 | |
| 11 | Push down the knob | 2 | | 11 | Push down the knob | 2 | |
| 12 | Press the yellow button | 1 | | 12 | Press the yellow button | 1 | |
| 13 | Pull out the ID paper | 1 | | 13 | Pull out the ID paper | 1 | |
| 14 | Press the yellow button | 1 | | 14 | Press the yellow button | 1 | |
| 15 | Pull out the ID paper | 2 | | 15 | Pull out the ID paper | 2 | |
| 16 | RH press yellow button LH pull out paper | 4 | | 16 | RH press yellow button LH pull out paper | 4 | |
| 17 | Throw away the paper | 1 | | 17 | Throw away the paper | 1 | |
| 18 | Close the cover | 1 | | 18 | Close the cover | | 1 |
| 19 | Set the place | 9 | | 19 | Set the place | | |
| Total | | 53 | 10 | Total | | 43 | 2 |

Changing Ribbon ID

| Before | | | | After | | | |
|--------|---|----------|----------|-------|---|----------|----------|
| No | Activities | Internal | External | No | Activities | Internal | External |
| 1 | Set the place | | 9 | 1 | Set the place | | |
| 2 | Open the cover | 1 | | 2 | Open the cover | 1 | |
| 3 | Take the new ribbon roll | 2 | | 3 | Take the new ribbon roll | 2 | |
| 4 | Placed the new ribbon roll | 2 | | 4 | Placed the new ribbon roll | 2 | |
| 5 | Push down the knob | 1 | | 5 | Push down the knob | 1 | |
| 6 | Rotate the roll | 3 | | 6 | Rotate the roll | 3 | |
| 7 | Take cutter | 1 | | 7 | Take cutter | 1 | |
| 8 | Cut the ribbon | 1 | | 8 | Cut the ribbon | 1 | |
| 9 | Remove the ribbon roll 1 | 1 | | 9 | Remove the ribbon roll 1 | 1 | |
| 10 | Placed the ribbon roll 1 | 8 | | 10 | Placed the ribbon roll 1 | 8 | |
| 11 | Take the new ribbon roll | 1 | | 11 | Take the new ribbon roll | 1 | |
| 12 | Remove plastic for new roll | 7 | | 12 | Remove plastic for new roll | 7 | |
| 13 | Placed the new roll in the desk | 1 | | 13 | Placed the new roll in the desk | 1 | |
| 14 | Remove the ribbon roll 2 | 3 | | 14 | Remove the ribbon roll 2 | 3 | |
| 15 | Pull out the ribbon from ribbon roll 2 | 12 | | 15 | Pull out the ribbon from ribbon roll 2 | 12 | |
| 16 | Throw the ribbon | 2 | | 16 | Throw the ribbon | 2 | |
| 17 | Install the roll to the machine | 5 | | 17 | Install the roll to the machine | 5 | |
| 18 | Take the new ribbon roll | 1 | | 18 | Take the new ribbon roll | 1 | |
| 19 | Install the ribbon roll to the machine | 6 | | 19 | Install the ribbon roll to the machine | 6 | |
| 20 | Set the ribbon in machine | 83 | | 20 | Set the ribbon in machine | 83 | |
| 21 | Pull out ID paper | 2 | | 21 | Pull out ID paper | 2 | |
| 22 | Press button to set machine | 2 | | 22 | Press button to set machine | 2 | |
| 23 | Set the machine | 1 | | 23 | Set the machine | 1 | |
| 24 | Pull out ID paper | 2 | | 24 | Pull out ID paper | 2 | |
| 25 | RH press button to set machine LH pull out ID paper | 6 | | 25 | RH press button to set machine LH pull out ID paper | 6 | |
| 26 | Monitoring and fixing roll position | 5 | | 26 | Monitoring and fixing roll position | 5 | |
| 27 | Close cover | 1 | | 27 | Close cover | | 1 |
| 28 | Set the place | | 9 | 28 | Set the place | | |
| Total | | 160 | 18 | Total | | 159 | 1 |

International Industrial Engineering Program
Universitas Atma Jaya Yogyakarta Supervisee of Internship Report
Sheet

Student name : Dewi Agustin Mahardika.....
 Student ID : 131407316.....
 Name of the Host Company : Western Digital.....
 Starting date of internship :
 Faculty supervisor : Luciani Triani Dewi, S.T, M.T.....

| No | Date | Agenda | Signature of Faculty Supervisor |
|----|------------|--|---|
| 1 | 9/3 2017. | Submission of Letter of Assignment of Supervisee (Surat Penugasan Pembibingan Kerja Praktek) |  |
| | | | |
| | 28/8 2017. | Submission of first draft of internship report |  |
| | 4/9/2017 | Revisi I |  |
| | 5/9/2017 | Revisi II |  |
| | | | |
| | 14/9/2017 | Approval of internship report |  |
| | | | |

- Pelaksanaan ujian:
 Jumat, 29 Sept. 2017
 waktu: 12:30 -

Internship Student Assessment

Name : Dewi Agustin Mahardika
 Student ID : 131407316
 University Name : Universitas Atma Jaya Yogyakarta, Indonesia
 Company : Western Digital
 Department : Operation Planning Department
 Internship Duration : April 19, 2017 – August 18, 2017

| No | Scoring Aspect | Score* |
|----|---|--------|
| 1 | Discipline | 10 |
| 2 | Working motivation | 10 |
| 3 | Responsibilities | 9 |
| 4 | Teamwork | 9 |
| 5 | Attitude | 10 |
| 6 | Ability to learn | 9 |
| 7 | Ability to work in project | 9 |
| 8 | Skill of work in project | 9 |
| 9 | Awareness of company facilities maintenance | 9 |
| 10 | Awareness of working safety | 8 |

*Score
 1-2 : Very bad
 3-4 : Bad
 5-6 : Average
 7-8 : Good
 9-10 : Very Good

Thailand, August 18, 2017

On Site Supervisor

Attarat D.

Attarat Donsakul

Ref. No: RSHOB17_103

Aug 16, 2017

To whom it may concern,

Dear Sir/Madam,

This is to certify that Ms. Dewi Agustin Mahardika, a student from Atma Jaya University Yogyakarta has completed the Cooperative & Work-Integrated Education in HDD Industrial Engineering department at Western Digital in Thailand.

For duration of working weeks from April 19, 2017 to August 18, 2017
She completed the following project:

- Back End Automation (BEA) Downtime Improvement.

During the working period, she has also improved upon different skills and knowledge that are recognized in the program of International Cooperative Education.

Presently, he has passed successfully all the project of Cooperative & Work-Integrated Education program.

Yours sincerely,



(Mr. Theerasak Sa-nguanmanasak)
Asia-University Relations & Recruitment Manager,
Western Digital (Thailand) Company Limited.