

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



Jeremy Desmond Jori
13 14 07387

INDUSTRIAL ENGINEERING PROGRAM
FACULTY OF INDUSTRIAL TECHNOLOGY
UNIVERSITAS ATMA JAYA YOGYAKARTA
YOGYAKARTA
2017

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:

Name : Jeremy Desmond Jori

Student ID : 13 14 07387

has been approved.

Yogyakarta, August 19, 2017

On site Mentor

On site Supervisor



Sawitree Vanhakij



Attarat Donsakul

Faculty Supervisor



The Jin Ai, ST., MT., Dr. Eng

ACKNOWLEDGEMENT

This internship report was written in order to meet the academic requirement for doing the final presentation. This report explains about the internship that was already done by the author at Western Digital Company. This report explains about the company as a place for doing the internship. Start with an introduction for doing the internship, company's background, company's system management, and the internship assignment that should be done by the author.

Author also would like to thank to Mr. The Jin Ai, ST., MT., Dr. Eng. as author's academic advisor because his advices and suggestions about doing the project during internship and writing the internship report.

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Yogyakarta, Oktober 2017

Author

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CHAPTER 1

INTRODUCTION

This chapter explains about the internship program in Industrial Engineering Department, Universitas Atma Jaya Yogyakarta. This part explains about the background of internship and the objective of internship. Besides that, this chapter mentions the place and the schedule of the internship.

According to this chapter, It will explain the internship that happen in Western Digital Thailand in order to complete target from the Universitas Atma Jaya Yogyakarta. In this chapter, it will explain the big scope of the final internship in Western Digital Thailand.

1.1. Background of Internship

Industrial Engineering Department, 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.

Industrial Engineering Faculty, Universitas Atma Jaya Yogyakarta provides an internship, 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. During the internship period 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. Make new relations with employees and friends
- b. Healthier life (sports everyday)
- c. Improve skills (Ms. Power Point, Ms. Excel, Auto cad 2D LT)
- d. Improve adaptability in the workplace
- e. Practice to speak English
- f. Observe the whole company for big scope resume
- g. Learn deeper about WD company in Thailand

1.3. Internship Location and Schedule

The internship was located at:

Western Digital (Thailand) Co., Ltd.
140 Moo 2, Bangpa-In Industrial Estate,
Udomsorayuth Road, Klongjig
Bangpa-In, Ayutthaya 13160 Thailand

The internship started from April 18, 2017 and finished at August 18, 2017 (4 months). Manufacturing department selected as the place to do the internship. Internship Author's schedule started at orientation to know how the current situation about Manufacturing Hard Disk Drive Department at Western Digital, Author was look about problem that became project by myself, learn about the process that related with the project. Author conducted observation to know the learn process directly and identify problem, analyzing data to decide the best solution that can be implemented, collecting result as report to presenting the project to HR Staff Western Digital.

Internship in WD company was started from April 18, 2017 and finished at August 18, 2017 (4 months). By the given option by former Mentor, I was located in

Operation Planning Dept., My project was taking care of Head Stack Assembly (HSA) hybrid line for Product Diablo and Apollo in the clean room in order to calculate the cycle Time of each product and implement a new option that will make any improvement in the production line. There are two kinds of improvement on-line and off-line improvement, so the first step is taking video, draw the layout for each improvement, calculate and analysis data, simulation for each stations and option for new improvement. After all step are done, at August 10, 2017 I was doing final presentation to HR (Human Resource) sr. manager (P' Theerasak) and 6S manager (P' Pisha) also the whole friends that attended at that time.

CHAPTER 2

COMPANY BACKGROUND

This chapter explains about the company background. This part tells about Western Digital profile, the organizational structure of Manufacturing Department, and the organization management. All about the company's identity explained in this chapter.

2.1. Company Profile

Western Digital was founded in 1970 as General Digital by Alvin Phillips. In July 1971 the name was changed into Western Digital and the first product, the UART (Universal Asynchronous Receiver Transmitter) WD (Western Digital) 1402 was released. In the years until 1975 Western Digital became a specialty semiconductor maker and the largest independent producer of calculator chips in the world.

In the years 1977 to 1982 the new CEO (Chief Executive Director) Charles Missler focused on research and development increasing the revenue of the company. WD entered the data storage industry in the early 1980s, manufacturing hard drive controllers. In 1983 WD started to provide a controller called WD1003 for IBM.

This controller was the basis of the ATA interface which was developed by WD along with other companies. Until the end of the 1980s WD used profits from the ATA controllers to become a general hardware supplier for PC industry. WD purchased manufacturers for graphic cards, chipsets and networking products. In 1988 WD bought the hard drive production branch of a company called Tandon and the first hard drives were manufactured.

Refer the Figure 1.1. several acquisitions in the years after 1988 brought new technology into the company, and a rising demand for hard drives, lead to accelerated growth for Western Digital.

In 1991 the market for hard disk controller boards started to decrease because PC industry moved to ATA (Advance Technology Attachment) and SCSI disks. The WD Caviar, a disk using embedded servo and computerized diagnostic systems, boomed in this time, so WD decided to sell its other divisions.

In 1999 all HDD (Hard Disk Drive) manufacturing was moved to Malaysia and the first drives for home entertainment users became available.



Figure 2.1. Increasing Demand for Hard Drives

One year later in 2000 the first external drive was released, and in 2004 WD entered the mobile hard drive market with Scorpio. In 2006 the external drives WD Passport and My Book were released. In 2010 the first 2.5" notebook drive with 750GB was released and one year later WD launched the first mobile hard drive with a capacity of 1 TB. Refer the Figure 2.2. today Western Digital has over 100.000 employees worldwide at locations in the US, Brazil, Malaysia, Thailand, Philippines, Singapore, Japan and China.

MANUFACTURING, RESEARCH & DEVELOPMENT WD & HGST Teams Around the World

WDC Employees Worldwide:
Over 84,500

● WD Locations ● HGST Locations
New locations indicated in green

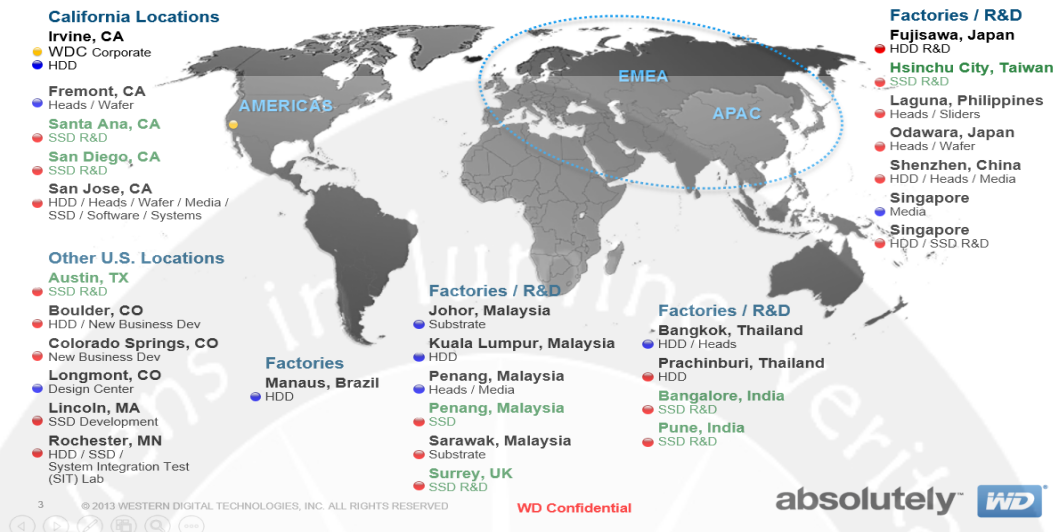


Figure 2.2. Western Digital Locations

2.1.1. Western Digital Thailand

The history of Western Digital Thailand began on December 20, 2001 with signing the acquisition agreement with Fujitsu Thailand. In August 2003 Magnetic Head Operations were acquired and in the following years WD became one of the largest manufacturers of hard drives in Thailand.

With roundabout 27.000 employees and a local economic impact of USD 20.302 Million Western Digital is one of the largest employers in Thailand.

On February 7, 2002 the first customer hard drives were shipped. Until today over 750 million hard drives were shipped to customers all over the world, for example Dell, Lenovo, Microsoft or Samsung.

In October 2011 the WD Thailand plant was flooded during a big flood and operations there stopped. Because of that it came to a shortage of hard disk drives and rising prices all over the world.

At the WD location in the Industrial Estate Authority of Thailand at Bang Pa-In Industrial Park, Ayutthaya hard drives are produced on a total space of 82.000 square meters with over 40% of clean room.

WDTH was awarded the Prime Ministers Best Industry Award in 2011 and the Thailand 5S Award in 2012.

2.2. Organizational Structure

Student is placed in Head Stack Assembly (HSA), the picture (Appendix 1) is the organizational structure for Operation Planning Department. This department was focus on improving every production that related with the time study and cycle time in production line. This department separated into 2 big area, on-line improvement and off-line improvement that located in clean room. On-line improvement related with main production line, instead off-line related with supporting area that will support the main line, and then off-line related with the kitting and packing area that will be assembled become finish good HSA and become HDD in the next station. Refer the Table 2.1 at the organizational structure these are 4 positions will be explained about the job description.

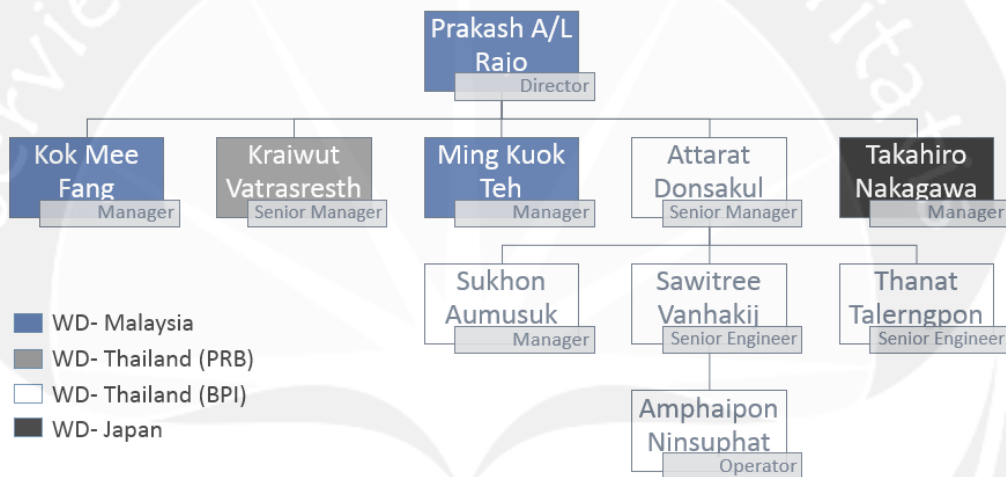


Figure 2.3. Organization Structure of Operation Planning Department

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.

Table 2.1. Responsibilities Position

Position	Description
Senior Manager	<ul style="list-style-type: none">a. To set-up, maintain and manage on efficient system for Operation Planning Departmentb. To provide, exercise and support WDT in all aspect of materials and system related activities, requisition strategic planning.c. To provide strategy & guidance on indirect supplier management to purchasing and its activities support MROd. To support WDT department connection with other WD factory engineering
Manager	<ul style="list-style-type: none">a. Demand and supply analysis for short term and long term. planning.b. Forecasting component per MPS requirementc. Managing volume allocation to strategic supplier align with sourcing strategy and cost reduction target.
Senior Engineer	<ul style="list-style-type: none">a. Adjust schedules, obtain materials, maintain equipment, and improve product flow.b. Track, analyze, forecast, and report on budgets and goals.c. Oversee department operations and staffing to reach production deadlines.d. Train and oversee staff, including in safety and regulatory compliance.
Operator	<ul style="list-style-type: none">a. Calculate cycle time studyb. Help senior Engineering job to arrange meeting

2.3. 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

a. 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

b. 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

c. 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

d. 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 explains about the company system. Start with showing the business process of Manufacturing Department. This part shows the business process diagram of Manufacturing. Next, the explanation about the products. This part tells about Western Digital products. After knowing the types of product, next part explains about the production process to build a hard drive. At last, this chapter explains about the production facility of Western Digital Thailand Company.

3.1. Business Process of the Department

Refer the Appendix 2 about Manufacturing HDD Department Business Process, the business process will be explained about process HDD (Hard Disk Drive) be made from receive material from Agility as warehouse to keep the raw material then the material will be accepted by receiving department and processed to preparing material like cleaning material in kitting in and out department in the clean room. The material will be assemble in assembly line processed became HDD on assembly area then be checked before it becomes finish good by using man and machine in each of every process.

Refer the Appendix 3, Author's Area projects was controlling the improvement in assembly HSA area. It started from kitting in and out and then APFA (Actuator Pivot Flex Assembly) will go to the production line of HSA assembly prime process start from ACF (Anisotropic Conductive Film) Laminate until Gasket Install process. It will be produced as HSA finish good after finish APAM (Anti-Personnel/ Anti Material) testing and will be put on HSA finish packing trolley, and the material handling will be delivered the finish good HSA to packing area and will be continued to assemble in another department.

3.2. Product

Western Digital as a digital storage manufacturer has many products. Refer the Figure 3.1 shows type of products from Western Digital. There are 6 categories of product from Western Digital. These are *desktop*, *mobile*, *enterprise*, *audio visual storage*, *network-attached storage*, and *digital home*. The most popular products are desktop and mobile hard drive. Desktop category consists of internal and

external hard drive for PC (desktop). Mobile category consists of internal and external hard drive for laptop.



Figure 3.1. Western Digital Products

3.2.1. Desktop Product

Desktop drive product or known as 3.5" drive can be classified into two types, internal and external desktop drive. Internal desktop drive is a storage solution for Personal Computer (PC) or well known as desktop computer. This hard drive is put inside the CPU. Whereas, external desktop drive is an additional desktop drive. This drive is put outside the CPU and connected with USB cable. Western Digital specifies again the product based on the operating system. There are desktop drives for Windows and Mac.



Figure 3.2. Internal Desktop Drive

Refer the Figure 3.2 shows types of internal desktop drives with different purposes. Western Digital provides solutions of data storage for customer with colors. WD has segmented their storage lineup into easy to recognize colors that give customers the power to choose the right product for their needs. *WD Blue* for everyday used, *WD Black* for performance used, *WD Red* for network attached storage (NAS) used, *WD Gold* for enterprise class and *WD Purple* for surveillance used. WD offers more than a one-size-fits-all storage solution.



Figure 3.3. My book – External Desktop Drive for Windows

Refer the Figure 3.3 the example of external desktop drive for Windows and Mac that useful for massive capacity for storing photos, videos, documents and music. Each has capacity of 2 TB – 16 TB. This product is optimized with USB 3.1 Gen 1 port to transfer data with a high speed than with USB 2.0 port. Western Digital plants a backup system inside the drive for data security.

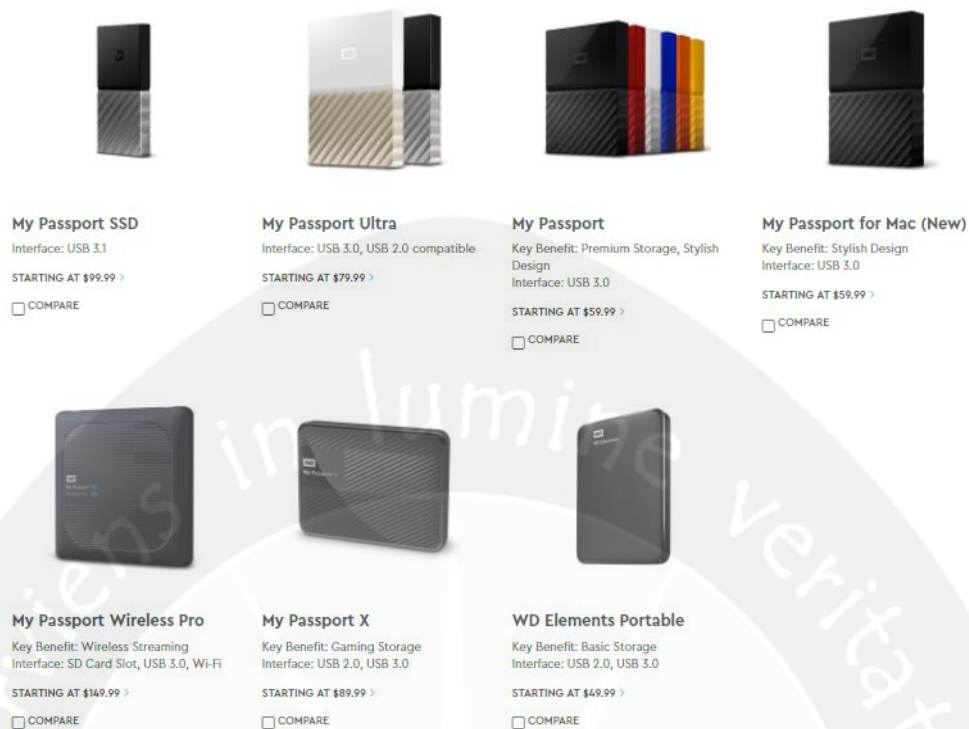


Figure 3.4. My Passport – Portable Drive for Windows and Mac

3.2.2. Portable Drive

Mobile drive product or known as 2.5" drive. Mobile drive products are classified into internal and external drive. This product dedicates to provide storage location for laptop. External mobile drive products are already known as portable hard drive. It is compatible for Windows and Mac operation system.

Refer the Figure 3.4. there is some example of portable drive for Windows and Mac. Start from My passport SSD until WD elements portable. Which each of products have their own capability, function and benefit. It has a lot of capacity variant started from 256 GB – 4 TB. It performs high speed data transfer using 3.1 Gen 1 USB port. It also has a feature for local or cloud data backup.



Figure 3.5. My Cloud – Personal Product

3.2.3. Network Attached System (NAS) Personal Product

Refer the Figure 3.11 is a product of consumer series, My Cloud Mirror. It has 2TB – 8TB of capacity. NAS product is the answer from Western Digital to follow the new storage technology using network, as known as cloud computing. Cloud computing enables users to store and access the data whenever and wherever they are, using internet service. There are two types of NAS product; Consumer series and Expert series. Consumer series product is for personal usage. Save everything in one safe place at home and access it from anywhere using computers, tablets and Smartphone.



Figure 3.6. My Cloud – Enterprise Product

3.2.4. Network Attached System (NAS) Business Product

Refer the Figure 3.5 are enterprise products, with space to keep virtually everything, the My Cloud Pro and Expert Series offers your creative team the network storage to edit, save and share production files from anywhere with an internet connection. It has capacity started from 0 TB – 32 TB, with 3.0 USB port that can deliver the data faster. It also compatible with Windows and Mac.

3.3. Production Process

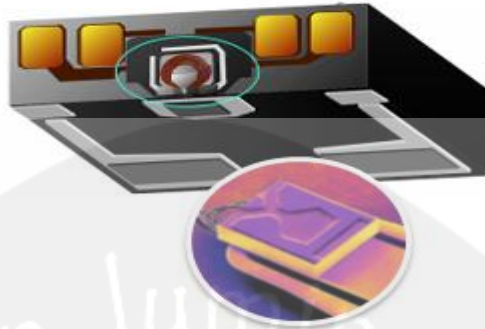


Figure 3.7. Slider Fabrication

Refer the Figure 3.7. the component that assembly starts with is called Slider Fabrication. In an improved process for fabricating thin film head sliders from a wafer on one face of which a plurality of electromagnetic devices are arranged in rows, a single-row bar is mechanically processed to form sliders while it remains an integral part of the wafer, or after it is bonded to a fixture under a condition which induces no bow on the bar.

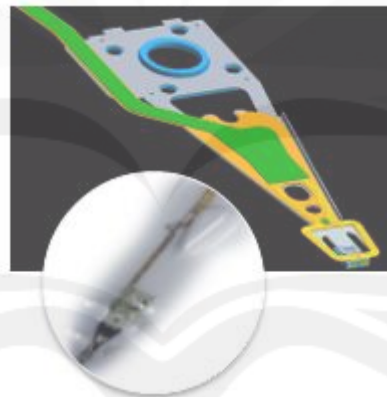


Figure 3.8. Head Gimbal Assembly

Refer the Figure 3.16 the next step is the Head Gimbal assembly of the part which is called A head-gimbal assembly of a hard disk drive includes a load beam connected to a pivot arm, a slider on which a magnetic head is mounted, an elastic support member having one end coupled to the load beam and the other free end portion at which the slider is supported, and a damper provided between the load beam and the slider to attenuate vibration transferred between the load beam and the slider.

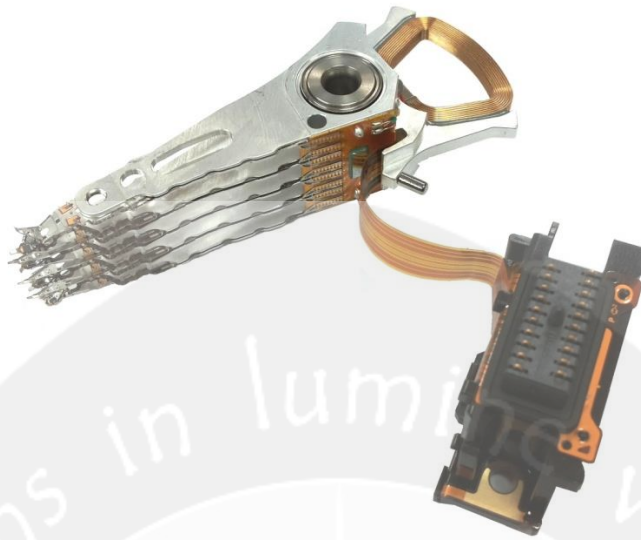


Figure 3.9. Head stack assembly

Refer the Figure 3.19 the Head Stack assembly (HSA) is needed to read data from and write data on the media. It mainly consists of the Actuator Pivot Flex Assembly (APFA) and the Head Gimbal Assembly which contains the reading heads.



Figure 3.10. Completed Hard Drive

Refer the Figure 3.22 after the assembly of all these components the drive is ready to run. It is now tested in various stations. After testing, the drives are packaged and prepared to ship.

3.4. Production Facility

Refer the Table 3.1 Western Digital Thailand has 2 factory sites. The first factory is located in Industrial Estate Authority of Thailand (I-EA-T Free Zone) 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 (Head Gimbal Assembly), tooling, with work hour 24 hours. Building 2 and 3 manufacturing HSA (Head Stack Assembly) and HGA, Building 4 for manufacturing HDD and engineering labs. Building 6 also as place for manufacturing HDD, HGA, and HSA

Table 3.1. Production Facilities

No.	Building	Function
1.	Building 1&2 	<input type="checkbox"/> Finished wafer processing into slider form and assembled into HGA <input type="checkbox"/> Process/Tooling R&D <input type="checkbox"/> Working hour: 24 hour/7days
2.	Building 2/Level 3 	<input type="checkbox"/> Manufacturing HSA to Support Desktop & Mobile HDD <input type="checkbox"/> Process, Equipment, Tooling and Automation Development <input type="checkbox"/> Manufacturing HSA and HGA
3.	Building 4 	<input type="checkbox"/> Manufacturing HDD for Desktop & Mobile application <input type="checkbox"/> Engineering labs
4.	Building 6 	<input type="checkbox"/> Manufacturing HDD for Desktop <input type="checkbox"/> Manufacturing HSA and HGA
5.	Navanakorn Site 	<input type="checkbox"/> Manufacturing HGA

to problems that the production process and also considering about improving utilization and productivity by seeing from result of CT (Cycle Time) and UPH (Unit Per Hour) in the process flow by removing any break down time and HC (Head Caught) that can possible to remove also re-arrange the process flow to improve the line balancing and cycle time manufacturing.

HSA (Head Stack Assembly) production flow in the clean rooms has divisions that conducting the production process for every day such as Kitting in, Kitting, Packing, Support Area, Rework area, Manual line and Hybrid line. Every division lead by supervisor for every team. During internship, author worked on HSA manufacturing. It was about hybrid automation line that leaded by a Manager of production line, he is Mr. Tepparit Tanoi.



Figure 4.2. Diablo 2305AB Hybrid Automation Line

At Hybrid automation line as the main targeted project in Western Digital Co., author has a Mentor. She was Sawitree Vanhakij. She helped a lot of the author projects to reducing the cycle time of process flow in the HSA section. Start from introducing of every line in the clean room until every step that needed to produce head stack assembly in the clean room. Start from steps to steps, author processed every part needed also observing every operator and machine available in the clean room. The main purpose of LEAN project is to reduce HC and improve productivity of every line that possible to improve by using continues improvement. The methods that the author use suggested by the mentor are Line balancing technique and ECRS (Eliminate, Combine, Re-arrange, Simplify) technique. It need to be start from collecting the data by video record and calculate the cycle time study of every steps. In the clean room itself every

production separate into in-line and off-line improvement. In-line improvement is improvement that located in the production line about every step , HC needed, machine down time, etc. In this case, the main target to be improve are in the VMI (Visual and Mechanical Inspection) and GK (Gasket Install) station while using method before but off-line improvement consists of Material Handling, Packing and Kitting area in the clean room or we can say that off-line is helping in-line improvement to achieve the target without included in production area itself. The main project was about reduce HC that possible to remove whether it is on-line or off-line, the other project was about improve combining the job of material handling operators with packing and kitting.

4.2. Rights and Responsibilities

Author have rights and responsibilities during internship. The responsibilities mean Author have to finish the assignment that assigned by Mentor or Author's department. The responsibilities of Author as following:

- a. Analysis on-line and off-line process production flow at Head stack assembly in Clean room
- b. Take video record of every station in hybrid automation line
- c. Drawing layout about process flow in clean room HSA
- d. Observe the output of every process, to know the defect output and the causes of itself.
- e. Doing the time study and line balancing calculation for analyzing every process
- f. Make options about improvement productivity and utilization by re-arrange process flow itself.
- g. Make simulation about every option included, cost, benefit, enabler and possibility
- h. Author have to make a report to mentor about every activity during the internship every week.

The rights that given to Author as following:

- a. Author permitted to take video (collect data) for every process and the other activity that related with HDD Manufacturing Departments.
- b. Author permitted to learn detail the production for process and also learn about description of part that assembled for hard disk drive.

- c. Author permitted to conduct the observation at every process to support the project that department assign to Author.
- d. Author permitted to ask, discuss or interview operator, leader at production floor to support the project.

4.3. Methodology to complete the assignment

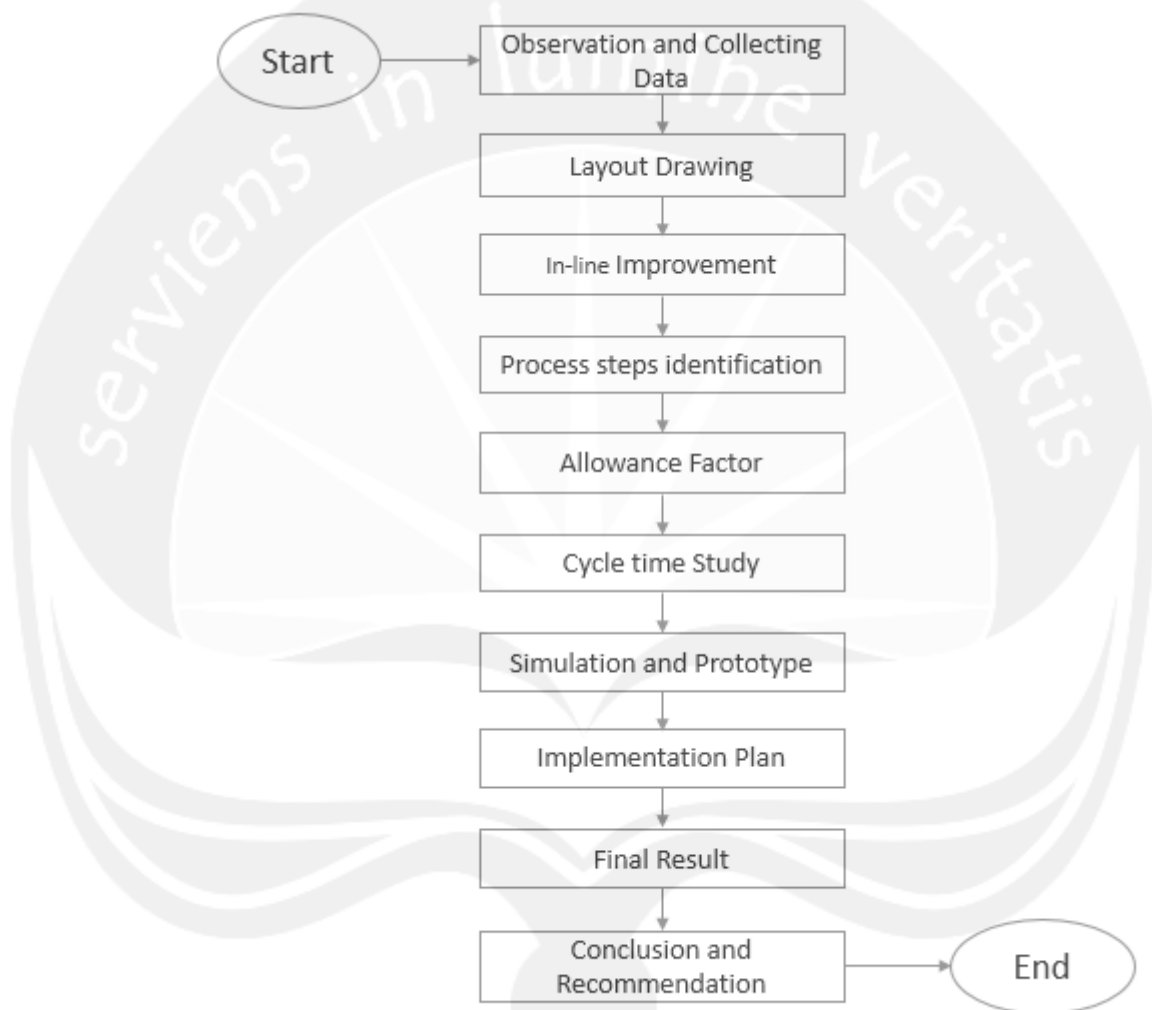


Figure 4.3. Methodology of Assignment

Author would like to explain to project about the steps or methods that the author used from the beginning of the internship until final result at the end of the internship in Western Digital Company. Start from background until the result of the project, first project was about improvement on-line HSA hybrid automation

line. Refer the Figure 4.1. Author conduct the project based on methodology that already made by Western Digital.

4.3.1. Observation and Collecting data



Figure 4.4 Clean Room Observation

The observation means observation to know problem causes by doing direct video recording of HSA assembly in hybrid automation line. After Author receive the problem then conduct the observation to investigate the causes and collecting data as well, Author analysis the process and the problem to find out the causes by collected data. On this step, Author went to the clean room almost every day to collect each data of the operator that doing assemble in HSA process.

4.3.2. Layout Drawing

After time study and analysis is done, Author make the new layout drawing for visual reality about what change happen in the production line. Start from the current layout that hybrid production line will start until the change happen after conducting the result. By put each of the detail in every worker that included in production line, for example how many worker need, how many can be reduce and what is the next improvement that happen in the line also put highlight in many possible and simple way.

4.3.3. In-line improvement

Author learn more detail process of project area in the clean room or production line. Separate step by step that the worker doing in production line by using visual management with the calculation of stopwatch and split into each of calculation, Mentor will ask Author roughly which part that the productivity can be improve. After first steps by collecting the data that we need to improve, we go further by which assembly line that we determine to improve. In this case we focused on in-line improvement of the main production line of Diablo products in hybrid automation line.

4.3.4. Process steps identification

Loading 4HD
Transfer shuttle from conveyor to angle box
Move tweezer dip IPA head up
HGA dip IPA #1
HGA to shuttle #1
Move tweezer dip IPA head down
HGA dip IPA #2
HGA to shuttle #2
Take balance weight #1
Input the Balance Weight to shuttle #1
Take balance weight #2
Input the Balance Weight to shuttle #2
HGA dip IPA #3
HGA to shuttle #3
HGA dip IPA #4
HGA to shuttle #4
Lock key alignment pin
Move shuttle to conveyor and scan DCM
Keep empty HGA tray up and tray down

Figure 4.5. Production Steps

Third steps, after which line and which part will be improve or implement, we will separate each of the steps that need to conduct the production line. Hybrid line itself has man and machine included in every step of making the finish good of head stack. Start from raw materials until the products become finish good and in this case is head stack. List of every steps will be detailed in the next step of clocking. Each of the stations have different process steps following each sequence to finish the product that will lead different process of clocking by taking the video record based on the data or how many station needed in the main process to observe the Diablo 2305AB hybrid automation line. In this case the video record has been taken more than 2 times in each station to indicate the worker do the similar jobs for the same station in each process steps.

4.3.5. Clocking

Station	S1	S2	S3	S4	S5	S6	S7
Process Steps #1	2.77	2.52	1.81	1.83	2.95	2.23	2.79
Process Steps #2	0.00	0.06	0.13	0.11	0.12	0.06	0.09
Process Steps #3	1.66	1.38	1.55	2.40	2.31	1.38	1.46
Process Steps #4	5.84	4.46	4.13	5.32	6.61	4.04	3.99
Process Steps #5	0.13	0.06	0.00	0.16	0.09	0.07	0.07
Process Steps #6	1.48	1.45	1.38	2.08	1.67	1.41	1.33
Process Steps #7	5.06	4.03	4.65	5.74	5.34	3.63	4.91
Process Steps #8	1.81	1.27	1.32	1.76	1.81	1.31	1.67
Process Steps #9	5.63	4.92	4.23	5.38	5.51	3.49	3.97
Process Steps #10	1.67	1.45	1.57	1.91	1.81	1.37	1.34
Process Steps #11	6.16	4.53	5.55	6.22	5.87	3.76	6.16
Process Steps #12	1.65	1.39	1.46	2.04	1.90	1.37	1.45
Process Steps #13	5.67	4.49	4.64	5.67	5.83	3.73	4.76
Process Steps #14	1.65	1.39	1.46	2.04	1.90	1.37	1.45
Process Steps #15	5.67	4.49	4.64	5.67	5.83	3.73	4.76
Process Steps #16	5.08	2.82	6.30	6.81	4.77	2.51	5.57
Process Steps #17	4.28	4.97	3.71	4.18	4.31	4.75	3.57
Process Steps #18	0.62	1.17	0.51	1.33	0.57	0.86	0.71
Cycle time	56.85	46.84	49.02	60.64	59.20	41.04	50.03
UPH	63	77	73	59	61	88	72

Figure 4.6. Clocking Process

In this step, after data and steps have been identify. The next steps are calculating each second of the steps by using stopwatch by the cycle of 12 times calculation to get the average time of every steps and from the result we can learn which part is being bottleneck of hybrid automation line steps in the production. In each column show the name of station in the first with each of the process steps, and in the next S1 until S7 will show the clocking data of each data that have been recorded, that will come up with the result of cycle time and UPH to analyze the improvement of targeted line.

4.3.6. Allowance Factor

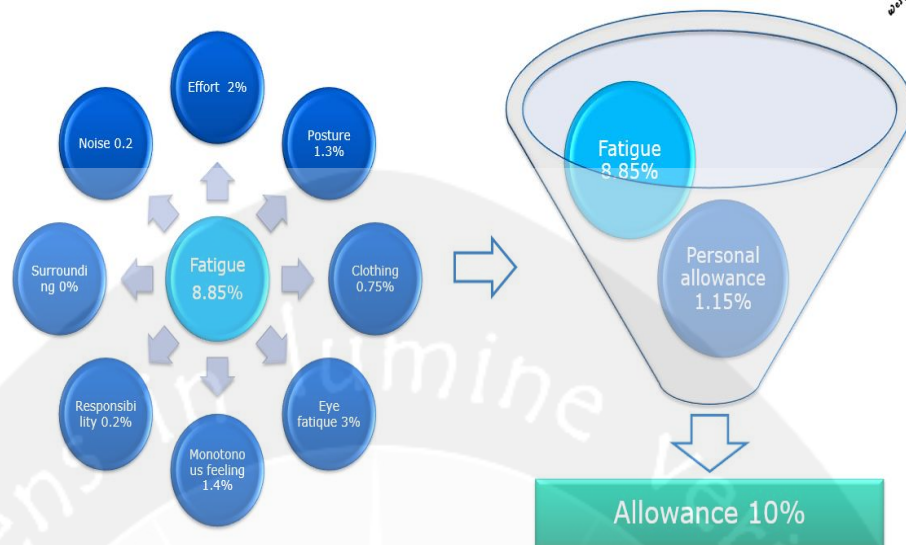


Figure 4.7. Allowance Factor Indicator

Before going to cycle time result, the calculation of clocking and the average will be calculated by the ergonomic factor which is allowance factor. Allowance factor is really important by helping the worker to help Western Digital to achieving the good production line because it will reduce the fatigue and other impact that will reducing the performance and the productivity of the worker and assembly line.

4.3.7. Cycle Time Study

Cycle time is the critical point of the calculation, in this step we determining the most significant aspect that effect the production line. In this step we will conduct new option that available by using ECRS and Line balancing technique that will come up the result which option that available and un-available to the hybrid automation line, and after that we can calculate the new unit per hour that should be improved by using the new option.

4.3.8. Simulation and prototype

While using the ECRS technique in the line balancing, the data in the table below is the Gasket Install standard time current. Start from pick and open the empty tray, until close and move the tray. The main target of the assignment that given by the mentor is to improve the productivity cycle time of the Diablo 2305AB Hybrid automation line. As seen in table 4.1. will explain the result of the cycle

time and UPH in the current line. The cycle time before implementation is 9.17 sec with UPH 393 unit.

Table 4.1. Gasket Install Current

Gasket Install Current (Last Station)	Standard time (Sec)
Pick and open the empty tray	0.26
Pick HSA from <i>Kanban</i> fixture	1.04
Install gasket	4.30
Move HSA to Conveyor	1.62
Scan the full HSA tray	1.20
Close and move the tray	0.74
Cycle time	9.16
UPH	393

In the Table 4.2. show the Gasket Install purpose on the column purpose. The Gasket Install station will become the first station before all of the station. Which mean there are some process step will change before and after the implementation process. The cycle time of each Gasket Install station will become 5.30 sec with 679 UPH. The gray color in the process step on purpose Gasket Install indicate that the process steps have been eliminated or re-arrange to another station using ECRS technique. In the remark column, will explain that pick HSA from Kanban fixture has been eliminated because the process step already unnecessary due to changing station, meanwhile move HSA to conveyor and scan the full HSA tray process steps will move to VMI station in purpose column. The process steps of Gasket Install will only become pick and open empty tray, Install Gasket and Close and move the tray which mean the new option will combine and eliminate some process steps using ECRS technique to another station and in this case the new station that will receive the process steps are VMI stations. Which make the cycle time of VMI station higher than before.

Table 4.2. Gasket Install Purpose

Gasket Install Purpose (First Station)	Purpose (Sec)	Remark
Pick and open the empty tray	0.26	-
Pick HSA from <i>Kanban</i> fixture		Eliminated
Install gasket	4.30	-
Move HSA to Conveyor		Move to VMI station
Scan the full HSA tray		Move to VMI station
Close and move the tray	0.74	-
Cycle time	5.30	-
UPH	679	-

While in the Table 4.3. Show that VMI standard time from method of clocking by stopwatch in the standard time and purpose of assembly line. The VMI process start from Move the tray from stair until the process steps of close and move the tray. In the process steps show that there are some steps changed using ECRS technique in form to improve the productivity of cycle time by distributing into other step. Move HAS to Kanban fixture will become unnecessary and will be eliminated due to the changing meanwhile scan the full HSA tray and close and move the tray will be added in the VMI process steps on purpose column because of the re-arrange method in the ECRS technique without changing the process steps sequence in VMI station. In the standard time column show the cycle time of VMI is 11.91 sec with 302 UPH, meanwhile in purpose there are some process steps change and the cycle time of VMI become 12.54 sec with 287 UPH.

Table 4.3. VMI Current and Purpose

VMI	Current (Sec)	Purpose (Sec)	Remark
Move the tray from stair	0.15	0.15	-
Open top cover the tray of HSA	0.10	0.10	-
Move HSA under the scope	0.94	0.94	-
Inspection HSA Side, E	2.66	2.66	-
Inspection HSA Side, A	3.17	3.17	-
Inspection HSA Side, B	0.83	0.83	-
Inspection HSA Side, D	2.75	2.75	-
Gasket to holder	0.00	0.00	-
Move HSA to <i>Kanban</i> fixture	1.31		Eliminated
Scan the full HSA tray		1.20	Move from Gasket Install
Close and move the tray		0.74	Move from Gasket Install
Cycle time	11.91	12.54	-
UPH	302	287	-

After we done with the process steps that have been purpose in the implementation structure, we can see in the Table 4.4. that show the current and purpose station for product Diablo 2305AB in hybrid automation line. The red color indicates the longest cycle time of station that still need to be improve , green round color indicates that the cycle time is already average the target or not too far from the target, green font show that there are some improvement that already show and will give benefit or zero impact to the line which means the cycle time will be improve and it will effect to productivity and utilization improvement, the yellow color will show the changing of each purpose in the sum of operator and improvement. In the current situation Gasket Install located in the last station but in the new purpose Gasket Install station locate in the first station,

which can save 1 worker from 16 workers on Diablo 2305AB become 15 workers in Gasket Install station by increasing the productivity by 15% from the current and utilization increase 2%.

Table 4.4. Simulation

Current			Purpose	
Operation	Std time (Sec)	HC support	Std time (Sec)	HC support
Gasket Install (1)			5.30	1
APFA Load (1)	5.26	1	5.26	1
ACF Inspection (1)	2.00	1	2.00	1
Loading 6X (8)	6.49	8	6.49	8
Unload (1)	4.94	1	4.94	1
Flip & Comb (1)	5.26	1	5.26	1
VMI (2)	5.95	2	6.27	2
Gasket Install (2)	4.58	2		
Line cycle time	6.49	16	6.49	15
Target line cycle time/DGR	7.0	9,817	7.0	10,583
Productivity and % Prod. Improvement	32.14	34.65	36.96	15%
% Utilization	76%		78%	2%

On this step, Author conduct to design the layout of production process and simulate the best solution by using line balancing technique and ECRS technique. The main target is to get the lowest cycle time available that below the targeted cycle time and balancing every step but still not changing the sequence of the steps that will be available to be implemented by using simulation cycle time study and line balancing technique. In this simulation steps every changing are possible as long as it still gain the productivity of the line and of course about the cost calculation need to change the hybrid automation line.

4.3.9. Implementation plan

The implementation plan is conduct when there are few best option that available to improve the productivity of the hybrid automation line. The author need to conduct a lot of meeting with the engineering, production and contamination team to develop the new best option that can give the highest benefit to the company by reducing many work that can be reduce to improve the productivity of the line.

4.3.10. Final Result

After all steps, finally we will get the best result of the simulation, and we will purpose into production line and ask for the feedback from them. It is possible or not and what should be needed, also what will happen to the production line of each part need to be detailed.

4.3.11. Conclusion and Recommendation

The final step is the conclusion and recommendation, by doing the continuous improvement, this step is really necessary. Because when the result come up, we still need to look in the critical aspect or parts that can still be improve. Because in the time we doing improvement, maybe the other factor may include that can recently change the implementation plan that already discuss before. So we need to make sure after the final result it will come up with the best result available.

4.4. Result of Assignment

The goal of this project is to improve productivity labor and unit per hour in the product of hybrid automation line Diablo. In this result, the target is to balance the workload using line balancing technique so the target cycle time is not higher than the target of 7.00 second.

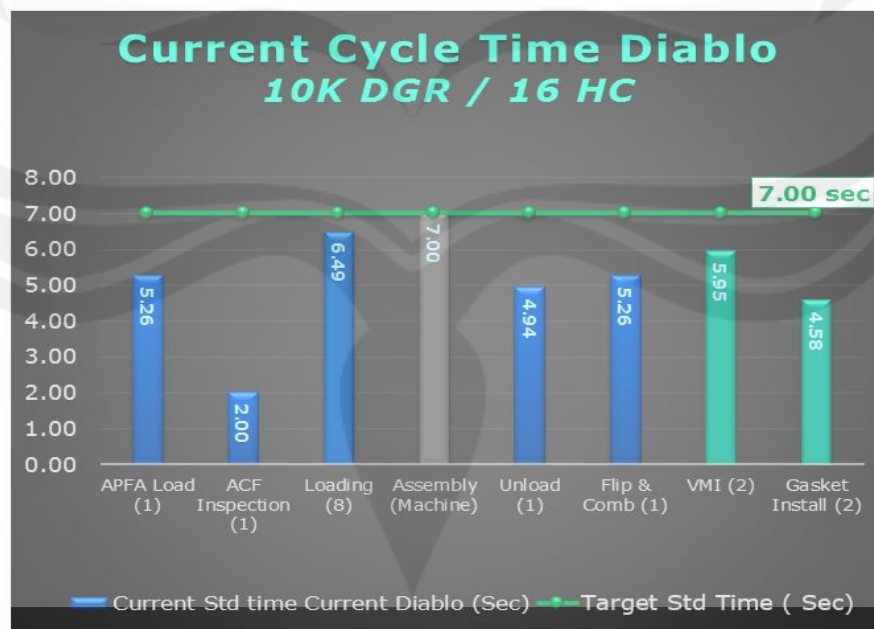


Figure 4.8. Graph of Cycle Time Study

The graph above showing each of the process flow in hybrid automation line of Diablo, start from APFA Load, ACF Inspection, HGA Loading, Assembly (Machine), Unload, Flip \$ Comb, VMI and Gasket Install. Each of the process have different amount of operators that will support. For example in HGA Loading have 8 operators, but in the Gasket Install only have 2 operators. Because each of the process need to be balance and meet the target of cycle time in 7 second.

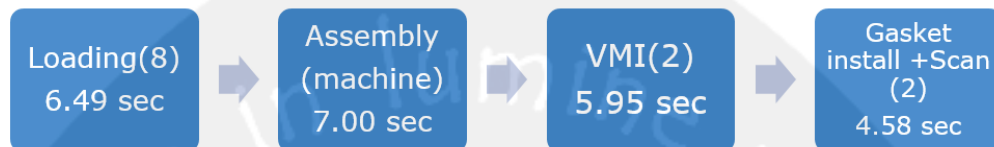


Figure 4.9. Before the implementation

The steps of producing head stack consist of steps that actually needed and have the same sequence. The targeted cycle time in the production is 7.00 sec, this is the simple explanation of each process flow in hybrid automation line started from HGA Loading 8 operators with 6.49 sec, Assembly by machine 7.00 sec, VMI 2 operator with 5.95 sec, and Gasket Install plus Scan 2 operators with 4.58 sec. Which each of the process have own steps and need to be set in order to be finish good Head stack. In this area we cannot change the sequence of assembly (machine) because the machine need to be fully automated to produce more goods by reducing cycle time with a better machine.



Figure 4.10. After the implementation

After the best result conducted. Above as we can see, after doing the simulation by using cycle time study and line balancing technique also ECRS technique included, We can move the Gasket Install into first station with 5.30 sec by 1 operator and then go to HGA Loading 8 operators, Assembly and Finish in VMI plus Scan by 2 operators with cycle time 6.27 Sec. This option is really good because it will balance the cycle time of HC in the production line without impact in any cycle time from the targeted project. It will give benefit by reducing one operator in Gasket Install that can lead into saving cost by calculating the ROI.

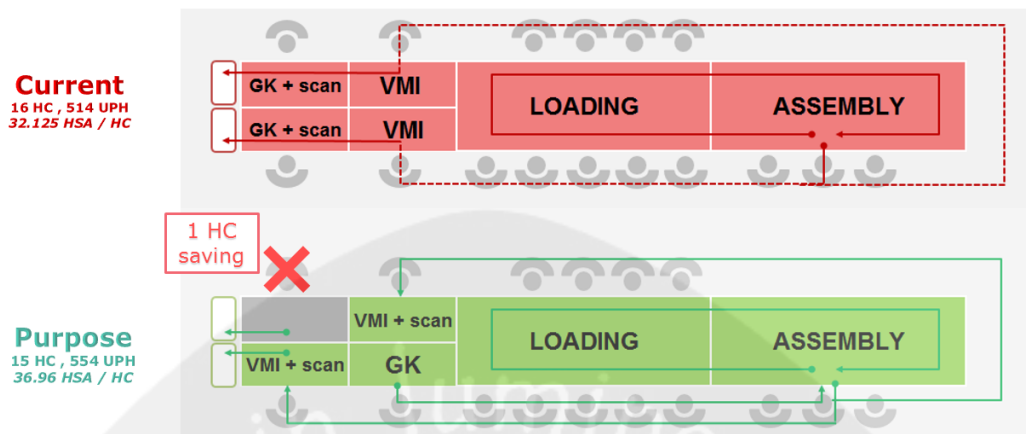


Figure 4.11. Current and Purpose Layout

From the current and purpose layout of assembly line above, as we can see we separate into 4 stations in production line, loading station by 8 operators, assembly station consists of machine but there are still 3 operators to help the machine to operate. And two most targeted project VMI and Gasket Install station to improve mostly. In the current layout there are 2 operators to operate Gasket Install and 2 operators to operate VMI but in the purpose option there are only 1 operator to operate Gasket Install so we can reduce 1 HC to saving cost in the production line.

After calculation, we can get the result by changing the operator steps in production. In this step we remove 1 operator in Gasket Install so we can produce 36.96 HSA / HC increasing from the current layout 32.125 HSA / HC with reducing 1 HC. In the other way it will increase the productivity of head stack assembly from 514 to 554 unit per hour by the Diablo production line, in that case WD can get benefit to save cost 1 operator by the calculation of :

Total Saving: 1 HC x \$1.7K/HC x 3 shift/day x 4 quarters = **\$20.4K / year / HC**

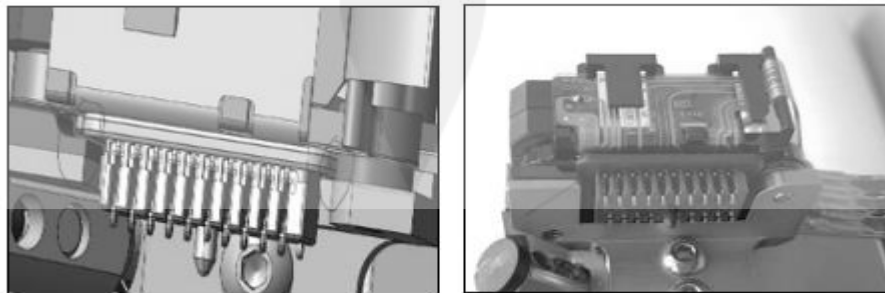


Figure 4.12. Modify Fixture

But after changing happen from current to purpose layout or steps, it need cost to modify fixture because there is a little gap in the assembly line fixture that needed to transfer the head stack in every process steps, that the contamination team process really taking care about it. Because the Western Digital hard disk need to near 100% performance in every possible way. To finally decide whether the purpose option is good or not we need to calculate based on the cost of modify fixture needed and the Return of Investment (ROI) available. If the ROI calculation is not that good so it clear that we cannot go to the purpose option. The cost to modify fixture we can get the calculation of:

Modify Fix: Fix quantity / line x Modify cost/fix: $60 \times \$30 = \$1.8K / \text{line} / \text{year}$

Finally, after we can get the total amount saving and cost needed to modify the fixture we can calculate the result of Return of Investment that will determine which the implementation need to be done or not in the calculation of down :

ROI Diablo: $\$1.8K / \$20.4K = 0.088 \text{ year} \sim 5 \text{ weeks}$

The return of investment is something that really critical to the calculation of spend and benefit in the company the target to calculate profit gained by investment of monetary resources, with the ROI of 5 weeks, it means the option are really good and soon will be implemented in production line because by removing 1 HC but still produce higher unit per hour than before. The easiest way to explain this is good ROI is coming from calculation of gains - total investment cost / total investment cost :

Simple ROI: $(20400 \$ - 1800 \$) / 1800 \$ = 1033\%$

With the result of 1033 % the conclusion is the option has really positive ROI, because the normal calculation of ROI is only 24%. Because of the result of percentage come out the Western Digital Company should do improvement in the way to saving cost by producing more finish goods and make more profit.



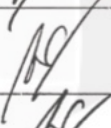
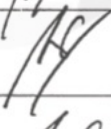
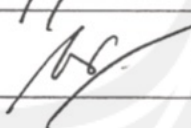

Appendix 1. Daily Log of Working Activity



Appendix 2. Supervisee of Internship Report Sheet

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

Student name : Jeremy Desmond
 Student ID : 131407387
 Name of the Host Company : Western Digital (Thailand) Co., Ltd.
 Starting date of internship : 19 April 2017 - 19 Agustus 2017
 Faculty supervisor : The Jin Ai S.T., M.T., Dr. Eng.

No	Date	Agenda	Signature of Faculty Supervisor
1	21/3/17	Submission of Letter of Assignment of Supervisee (Surat Penugasan Pembibingan Kerja Praktek)	
	7/9/17	Submission of first draft of internship report	
	18/9/17	Discussion of Report	
	26/10/17	Report checking	
	30/10/17	Report checking	
	31/10/17	Approval of internship report	

Internship Student Assessment

Name : Jeremy Desmond Jori
Student ID : 131407387
University Name : Universitas Atma Jaya Yogyakarta
Company : Western Digital
Department : Operation Planning Department
Internship Duration : April 19, 2017 – August 18, 2017

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

*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



Sawitree Vanhakij

March 14, 2017

Dear Jeremy Desmond Jori,

Western Digital (Thailand) Co., Ltd. would like to inform that you already received an acceptance to do a CWIE program (Cooperative & Work Integrated Education) with company from April - August 2017.

Your CWIE program is under HDD Industrial Engineering department. Your mentor is K. Attarat D.

Yours sincerely,



(Mr. Theerasak Sa-ngunmanasak)
Manager of University Relations and Recruitment
Western Digital (Thailand) Company Limited

Ref. No: RSHOB17_104
Aug 16, 2017

To whom it may concern,

Dear Sir/Madam,

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


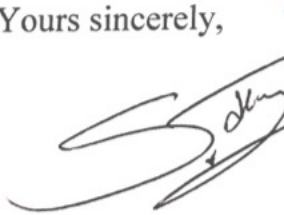
For duration of working weeks from April 19, 2017 to August 18, 2017
He completed the following project:

- Multi Platter Productivity Improvement.

During the working period, he 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.

CWIEs Student Invention and Confidentiality Agreement

I, the undersigned employee, enter into this Employee Invention and Confidentiality Agreement (this "Agreement") with Western Digital (Thailand) Company Limited ("WD"). In consideration of my employment or continued employment with WD, or a current or future direct or indirect subsidiary or affiliate of WD or Western Digital Technologies, Inc. including without limitation Western Digital Technologies, Inc., Western Digital (Fremont), LLC, WD Media, LLC, and Western Digital Corporation (individually and collectively referred to as "the Company"), and for other good and valuable consideration including my salary and other compensation as an employee, the receipt of which is hereby acknowledged, I agree with WD as follows:

1. **Effective Date.** This Agreement is effective as of the earlier of: (i) the commencement of my employment with WD or a current or future subsidiary or affiliate of WD, or (ii) the date and time at which Confidential Information was or is first disclosed to me.

2. **Intellectual Property Ownership.** I agree and acknowledge that WD's rights include all Intellectual Property rights (subject to the exclusion in Section 2(c) below), that I solely or jointly perform, create, design, or develop by virtue of my employment with the Company, whether before or after I have executed this Agreement and that ownership of all such Intellectual Property hereby vests in WD. As used herein, the term Intellectual Property includes, but is not limited to, inventions, inventive acts (including an act of conception or of reduction to practice), patents, patent applications, copyrights, trade secrets, trademarks, designs, and trade dress. The Intellectual Property WD owns under this paragraph includes, but is not limited to, all Intellectual Property I conceive of or reduce to practice during my employment with WD or a current or future subsidiary or affiliate of WD (whether or not during regular working hours) that may be embodied in, or used in, the making or operation of the Company's past, current, or future products, processes, systems, software, or services.

a) **Intellectual Property Disclosure.** I shall promptly and fully disclose all Intellectual Property, whether protectable or unprotectable, that WD owns pursuant to Section 2 of this Agreement to my supervisor or such other official as the Company may designate for such purpose. I shall also promptly and fully disclose all intellectual property, whether protectable or unprotectable, that I believe to be subject to the exclusion in Section 2(c) of this Agreement, to my supervisor or other official as the Company may designate for such purpose, so as to enable the Company to determine whether such intellectual property is subject to this Agreement.

b) **Previously Conceived Intellectual Property.** I understand that I am obligated to identify any previously conceived inventions, discoveries, original works of authorship, developments, improvements, and trade secrets in which I have a personal ownership interest that was obtained prior to my employment with the Company ("Prior Inventions"). I do not claim any right in any Prior Inventions except as may be set forth on an exhibit hereto, which an authorized WD representative and a member of the Company Legal Department acknowledges on the face thereof to be a part of this Agreement. Furthermore, I hereby warrant and represent that if I have identified any Prior Inventions, then I have identified a complete list of all of my Prior Inventions and that those Prior Inventions will not materially affect my ability to perform my job duties for the Company. I understand that I retain ownership to such Prior Inventions and that, other than the description below, I hereby warrant and represent that I will not disclose specific details of such Prior Inventions to other Company employees, or otherwise cause the Company to use Prior Inventions, without first obtaining a signed written consent by an authorized Company representative and the Legal Department. If, however, at any time during my employment, I (i) disclose or make available such Prior Inventions to a Company employee; (ii) cause the Company to use a Prior Invention or incorporate a Prior Invention into any product, process, service, technology, or other work by or on behalf of the Company; or (iii) use Company Confidential Information to expand, change, modify, license, and/or enforce my Prior Inventions, I hereby grant to the Company, without any limitations or any additional remuneration, a worldwide, non-exclusive, royalty-free, fully paid-up, irrevocable, perpetual, transferable, license—with the right to grant and authorize sublicenses—to make, have made, modify, use, import, offer for sale, and sell products, processes, services, technologies or other works using or incorporating such Prior Invention and to practice any method related thereto.

c) **Exclusion for Employees in Certain Countries.** I acknowledge and understand that nothing in this Agreement shall be construed to assign any rights that I may retain under applicable laws of the country where I typically perform my activities as an employee of the Company (hereinafter, "Principal Place of Employment").

3. **Intellectual Property Assignment.** I agree to and do hereby grant and assign to WD my entire right, title, and interest in and to all Intellectual Property (other than an invention subject to the exclusion referred to in Section 2(c) above) that I have acquired or will acquire during the term of my employment with the Company that (1) is developed at least in part during the hours of my employment; (2) is developed using Company equipment, supplies, facilities, or trade secrets; (3) relates at the time it is created, conceived, or reduced to practice to Company's business or to the actual or demonstrably anticipated research or development of Company; or (4) results from any work I perform for Company.

a) **Further Assistance.** I hereby agree to execute every lawful document that the Company requests me to execute (whether or not during the term of my employment with WD or a current or future subsidiary or affiliate of WD) in connection with the protection of WD's Intellectual Property rights. Such lawful documents include, but are not limited to, declarations and assignments including declarations of inventorship for filing and prosecuting patent applications on inventions that WD owns pursuant to this Agreement, and further assignments to show title to works of authorship and applications for copyright recordal that WD owns pursuant to this Agreement. I shall give such further assistance, including but not limited to information and testimony, pursuant to the Company's request (whether or not during the term of my employment with the Company, but if after the term of my employment with the Company, then for reasonable compensation for my time, except for the period of time when I am testifying under oath) in connection with its defense, assertion, or protection of WD's Intellectual Property rights. The Company shall reimburse me for reasonable out-of-pocket expenses that I necessarily incur in connection with giving such further assistance.

b) **Power of Attorney.** In the event that WD is unable to secure my signature on any document required by WD under Section 3(a) or any document necessary to apply for, establish, prosecute, obtain, or enforce any patent, copyright, or other right or protection relating to any WD Intellectual Property rights, whether due to mental or physical incapacity or other cause, I hereby irrevocably designate and appoint WD and each of its duly authorized officers and agents as my agent and attorney-in-fact, to act for and in my behalf and stead to execute and file any such documents and to do all other lawfully permitted acts to further the prosecution, issuance, and enforcement of patents, copyrights, or other rights or protections with the same force and effect as if executed and delivered by me.

c) **Waiver of Moral Rights.** I acknowledge and understand that the Thai Copyright Act, Section 18, provides that the creator of a copyrighted work is entitled to identify himself as the creator of the work, and to prohibit the assignee of the copyright for any other person from distorting, abridging, adapting, or doing anything to the work so as to cause damage to the creator's reputation or prestige ("Moral Rights"). I hereby agree to waive all such Moral Rights in connection with all copyrighted works owned by the Company pursuant to this Agreement.

10. **Non-Solicitation.** During my employment with the Company and for a period of one (1) year following the termination of my employment, I shall not (whether on my own or in active concert with anyone else) directly or indirectly solicit any person from the Company, whether such person is an employee, a consultant, or an independent contractor, to terminate their employment or engagement with the Company or to become employed by me or any third party. I acknowledge and agree that the foregoing covenants are reasonable and necessary to protect the Company's trade secrets and stable workforce. The foregoing shall not prevent or restrict employment of any person as a result of an unsolicited response of such person to a generally circulated offer of an employment opportunity.

11. **Use of My Image.** I hereby grant the Company permission to use any images taken of me by or on behalf of the Company during my employment with the Company for commercial or non-commercial materials and collateral, including, but not limited to, the Company's websites, SEC documents, presentations, signage and advertisements. I understand that I will not receive any additional compensation for such use and hereby release the Company and anyone working on behalf of the Company in connection with the use of my image.

12. **Termination of Certification.** Upon the termination of my employment with the Company for any reason, I agree to immediately sign and deliver to the Company the "Termination Certification" attached hereto as Exhibit A or, if directed by the Company, a similar document provided by the Company. I also agree to keep the Company advised of my home and business address for a period of three (3) years after termination of my employment with the Company, so that the Company can contact me regarding my continuing obligations provided by this Agreement.

13. **Notification of New Employer.** I hereby grant the Company my consent to notify any of my subsequent employers about my obligations under this Agreement.

14. **Entire Agreement.** This Agreement constitutes the entire agreement between me and the Company pertaining to the subject matter hereof and supersedes all prior and contemporaneous agreements, understandings, and representations of the parties.

15. **Severability.** If any provision of this Agreement is held to be invalid or unenforceable, then such provision shall, to the extent of such invalidity or unenforceability, be severed, but without affecting the remainder of such provision or any other provision contained in this Agreement, all of which shall continue in full force and effect.

16. **Governing Law.** If my Principal Place of Employment is in the United States, this Agreement shall be governed by and construed in accordance with the laws of the state of my Principal Place of Employment. If my Principal Place of Employment is in any other country, this Agreement shall be governed by and construed in accordance with the laws of such country.

17. **Enforcement.** I agree that any breach by me of Sections 2, 3, 4, 5, 7 or 8 of this Agreement cannot adequately be compensated by money damages in an action at law, and thus WD or the Company shall be entitled to immediate injunctive relief, before any appropriate court of law, to enforce the terms thereof. No remedy conferred by any of the specific provisions of this Agreement is intended to be exclusive of any other remedy at law, and the election of one or more remedies by WD or the Company will not constitute a waiver of its right to pursue other available remedies.

18. **Continuing Obligations.** My obligations under this Agreement continue in effect beyond the term of my employment with the Company, and my obligations are binding on my assigns, heirs, executors, administrators, and other legal representatives.

19. **No Waiver.** A waiver of any condition or term in this Agreement will not be construed to have any effect on the remaining terms or conditions, nor will it be construed as a waiver of any future condition or term.

20. **Amendments.** This Agreement may be amended, modified, or superseded only by a written document authorized by a Company Legal Department attorney that is executed by myself and an authorized representative of the Company.

21. **Languages.** This Agreement is written in the English and Thai languages, both of which are equally authentic. In the event of a discrepancy between the two versions, the English language version shall prevail.

IN WITNESS WHEREOF, I have executed this Agreement on the day and the year written below.

Dated: 19-Apr-17

Signed: 

CW/ES Student ID Number: RSHOB17_104 Print Full Name: JEREMY DESMOND JORI

Company Representative Acknowledgment:

Name / Title: Theerasak Sa-nguammanasak / Manager, Asia URR/ TA department

Signature: 



THIS CERTIFICATE IS PROUDLY PRESENTED TO

MR. JEREMY DESMOND JORI

In recognition of your outstanding achievement in
**Project Presentation of Cooperative & Work
Integrated Education Program**

A handwritten signature in blue ink, appearing to read "Theerasak", is positioned above a horizontal line.

Theerasak Sa-nguanmanasak
Asia-University Relations & Recruitment Manager
Global Talent Acquisition Department

Date: 10 August 2017

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