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8th INTERNATIONAL SEMINAR ON INDUSTRIAL ENGINEERING AND MANAGEMENT (8th ISIEM)

Technopreneurship as The Spirit of Innovation-Based Industrial Development Towards Global Competitiveness

Atria Hotel & Conference
Malang, East Java, Indonesia
March 17 – 19, 2015

ISIEM

Tarumanagara University, Trisakti University, Al Azhar Indonesia University, Esa Unggul University, Atma Jaya Catholic University of Indonesia, Pasudan University, Telkom University, & University of Muhammadiyah Malang

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P R O C E E D I N G

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Organized by: Industrial Engineering Department of
• Tarumanagara University • Trisakti University •
• Esa Unggul University • Al Azhar Indonesia University •
• Atma Jaya Catholic University of Indonesia • Pasundan University •
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PREFACE

Dear Presenters and Delegates,

On behalf of the Organizing Committee, I am honered to welcome you to the 8th International Seminar on Industrial Engineering and Management (ISIEM). This seminar is organized by the Industrial Engineering Department from eight Universities, namely Tarumanagara University, Trisakti University, Esa Unggul University, Pasundan University, Atma Jaya Catholic University of Indonesia, Al Azhar Indonesia University, Telkom University and University of Muhammadiyah Malang.

This seminar is held to provide an effective forum for distinguished invited speakers, academicians, engineers, professionals and practitioners from Universities, research institutions, government agencies and industries to share or exchange ideas, experiences and recent progress in Industrial Engineering and Management.

We are very convinced that our presenter and delegates will gain many shared ideas and great experiences from this conference. Furthermore, our participants will enjoy additional insights from our plenary sessions' speakers, i.e., Associate Prof. Dr. Montalee Sasananan from Thammasat University, Thailand and Prof. Younghwan Lee, Ph.D from Kumoh National Institute of Technology, South Korea.

Through this seminar, we are committed to promote sustainable innovation in industrial technology, information and management in order to increase industrial competitiveness in facing the global challenges in industrial environment. Once again, it is my great honor to welcome you to the 8th International Seminar on Industrial Engineering and Management (ISIEM) 2015 in the great cultural city of Malang, Indonesia.

Best wishes,

Chair of the 8th ISIEM 2015
Dr. Ir. Lamto Widodo, M.T.

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AGENDA

Day 1 (March 17, 2015)

18:00 - 18:30	Registration
18:30 - 19:30	Dinner
19:30 - 19:45	Opening Ceremony: Representation of Tarumanagara , Trisakti, Esa Unggul, Pasundan, Al Azhar Indonesia, Atma Jaya, Telkom and Muhammadiyah Malang University's greeting
19:45 - 21:00	Keynote # 1 **Assc. Prof. Dr. Montalee Sasananan** **(Thammasat University, Thailand)**

Day 2 (March 18, 2015)

6:30 - 8:00	Breakfast and Registration
8:00 - 9:15	Keynote # 2 **Prof. Younghwon Lee, Ph.D** **(Kumoh National Institute of Technology, South Korea)**
9:15 - 9:30	Coffee and Tea Break
9:30 - 12:00	Parallel session #1
12:00 - 13:00	Lunch break
13:00 - 15:30	Parallel session #2
15:30 - 15:45	Coffee and Tea Break
18:15 - 20:00	Dinner

Day 3 (March 19, 2015)

6:30 - 8:30	Breakfast
8:30 - 10:00	Parallel session #3
10:00 - 17:00	City Tour

MARCH 18 SESSION 2 ROOM 3 (IM)

Moderator : Lina Gozali , S.T., M.M.

Time	Paper	Code	Paper Code
13.00-13.15	DESIGN AND MAKING OF TELEVISION ADVERTISEMENT OF PD. BPR BANK JOGJA WITH *VISUAL EFFECT* Mei Parwanto Kurniawan, Agus Purwanto, Hafidh Rezha Maulana Informatics Engineering Master Program, STMIK AMIKOM Yogyakarta Informatics Engineering, STMIK AMIKOM Yogyakarta Yogyakarta, Indonesia	IM	12
13.15-13.30	THE ALGORITHM FOR NEGOTIATING PRICES IN A PALM OIL SUPPLY CHAIN Syarif Hidayat Al Azhar Indonesia University	IM	16
13.30-13.45	DESIGN OF IT GOVERNANCE MODEL IN XYZ COLLEGE Rizqi Sukma Kharisma, Anggit Dwi Hartanto STMIK AMIKOM Yogyakarta	IM	18
13.45-14.00	EBOLA VIRUS DISEASE PREVENTION - A PROBLEM SOLVING STRATEGY BASED ON SARS CASE STUDY FROM TAIWAN Simon Wu Chung Yuan Christian University	IM	27
14.00-14.15	FRUGAL INNOVATION CHARACTERISTICS: MARKET, PRODUCT AND BUSINESS PERSPECTIVE Teddy Sjafrizal Telkom University	IM	34
14.15-14.30	LABWORK MANAGEMENT INFORMATION SYSTEM SATISFACTION MEASUREMENT IN INDUSTRIAL ENGINEERING STUDY PROGRAM TELKOM UNIVERSITY Rayinda Pramuditya Soesanto, Amelia Kurniawati, Muhammad Iqbal Telkom University	IM	47
14.30-14.45	DESIGNING A MULTIDIMENSIONAL DATA WAREHOUSE FOR PROCUREMENT PROCESSES ANALYSIS USING BUSINESS DIMENSIONAL LIFECYCLE METHOD (CASE STUDY ON PT. ABC) Ari Yanuar Ridwan Telkom University	IM	57
14.45-15.00	BRAND EQUITY AS A HIGHER STANDARD OF LIVING AND WEALTH IN DEVELOPMENT COUNTRY: THE STRATEGIC ROLE OF INTEGRATIVE MODEL ON CONSUMER-BASED BRAND EQUITY TO REDUCE INDONESIAN POVERTY Maria Mia Kristanti Widya Mandala Catholic University	IM	59
15.00-15.15	CUSTOMERS CLUSTERING BASED ON RFM SCORE USING GENETIC ALGORITHM Muhammad Ridwan Andi Purnomo, Nur Riana Fajarwati Islamic University of Indonesia	IM	61
15.15-15.30	PROPOSED BUSINESS PROCESS USING BUSINESS PROCESS IMPROVEMENT AT EMERGENCY DEPARTEMENT OF DUSTIRA HOSPITAL Fadhila Rachmawati, Sri Widaningrum, Mira Rahayu Telkom University	IM	78

MARCH 18 SESSION 3 ROOM 3 (IM, PS, SCM)

Moderator : Andre Sugioko, S.T., M.T.

Time	Paper	Code	Paper Code
15.45-16.00	SPINNING MACHINE MAINTENANCE SCHEDULING AND COST PLANNING UNIT USING MARKOV CHAINS METHOD AT ARGO PANTES Puspa Puspitasari, Ahmad Juang Pratama Al Azhar Indonesia University	PS	103
16.00-16.15	BUSINESS MODEL GENERATION AND LEAN STARTUP METHOD AS THE BASIS FOR BUSINESS DEVELOPMENT FEASIBILITY STUDY, CASE STUDY OF PO. GAJAH MUNGKUR SEJAHTERA Wisnu Sakti Dewobroto, Julisa Siagian Trisakti University	IM	79
16.15-16.30	DESIGN OF PERFORMANCE MEASUREMENT SYSTEM IN ENGINEERING DEPARTMENT BASED ON MAINTENANCE SCORECARD FRAMEWORK AND OMAX MODEL: A CASE STUDY OF GLOBAL SANITARY WARE COMPANY Wilson Kosasih, Silvi Ariyanti, Nathan Sukamto Tarumanagara University	IM	81
16.30-16.45	FACTORY PLASTIC BAG LAYOUT DESIGN IN ELITE RECYCLING INDONESIA EXTENSION Lina Gozali, Iveline Anne Marie, Prisca Andriani Tarumanagara University; Trisakti University	PS	01
16.45-17.00	IMPROVEMENT OF KANBAN SYSTEM USING CONSTANT QUANTITY WITHDRAWAL SYSTEM TO FULFILL BUFFER STOCK REPLENISHMENT ON SINGLE AISLE PROJECT AT PT. XX Hadi Muqti, Pratya Poeri Suryadhini, Widia Juliani, Dida Diah D. Telkom University	PS	45
17.00-17.15	DESIGNING BUSINESS PROCESS TO SUPPORT BALANCED SCORECARD-BASED PERFORMANCE MEASUREMENT (CASE STUDY: FACULTY OF ENGINEERING, ATMA JAYA CATHOLIC UNIVERSITY OF INDONESIA) Vivi Triyanti, Nixon William Kumala Atma Jaya Catholic University of Indonesia	IM	99
17.15-17.30	REVIEW OF CURRENT RECRUITMENT PROCESS (CASE STUDY : PT. X) Mellisa Taswin, Marsellinus Bachtiar, Vivi Triyanti Atma Jaya Catholic University of Indonesia	IM	96
17.30-17.45	LEAN AND GREEN APPROACH IN DEVISING OPTIMIZATION PROGRAM TO DETERMINE DISTRIBUTION ROUTES BY USING TABU SEARCH METHOD Christine Natalia, Andre Sugioko, Clara Anne Atma Jaya Indonesia Catholic University	SCM	98
17.45-18.00	SYSTEM DYNAMIC FOR ACCELERATION MODELING POLICY IN DISADVANTAGE AREAS DEVELOPMENT Fajar Kurniawan, Iphov Kumala Sriwana Saint Mary's University, Hong Kong; Esa Unggul University	IM	95
18.00-18.15	ANALYSIS OF INFORMATION SHARING IMPACT IN TWO LEVEL SUPPLY CHAIN WITH MULTIPLE RETAILERS (CASE STUDY IN TWO MANUFACTURING COMPANIES, PT XY AND PT YZ) Nurul Chairany, Imam Baihaqi, Noerhayati Amirullah YAPPI; Sepuluh Nopember Institute of Technology	SCM	69
18.15-18.30	LEAN MANUFACTURING APPROACH WITH PARTICLE SWARM OPTIMIZATION-LINE BALANCING Rahmi Maulidya, Parwadi Moengin, Nisa Andama Trisakti University	PS	102

PS-Production System

CERTIFICATE

Presented to:

LINA GOZALI

as

PRESENTER

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FACTORY PLASTIC BAG LAYOUT DESIGN IN ELITE RECYCLING INDONESIA EXTENSION

Lina Gozali[1], Iveline Anne Marie[2], Prisca Andriani[3]

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ABSTRACT

Plastic bags help people in everyday life. PT. Elastis Reka Aktif (ERA Plastik) is one of the industry engaged in manufacturing plastics. In 2014, PT. ERA plastik wants to expand to meet the needs of the market by opening a new plant with a capacity of 300 tons per month located at Jl. Raya Gema Lapik, South Cikarang which has a land area of 6000 m^2 and a building area of 2200 m^2. To meet this need, this research aims to design the layout of a new plastic bag factory based approach Systematic Layout Planning (SLP). Based on the data input activities planned for the plant, the routing calculation sheet to determine the needs of the number of machines on the production floor, followed by the determination of manufacturing activities as well as facilities to support the needs of area calculation for each manufacturing facility. Next, performed linkage analysis between overall plant facility designed in Activity Relationship Chart (ARC) Plant. Based on the close relationship ARC Factory, design layout is done by using an algorithmic approach Relationship diagraming method to get the draft Activity Relationship Diagram (ARD) as a basis for designing factories Area Allocation Diagram (AAD) Plant. Because of the available land has limited, the design of the layout of the factory developed into three alternative layouts drawn using Autocad software 2010. Alternative layout will be evaluated quantitatively by calculating the values of closeness scores and use the checklist Material Handling Evaluation Sheet. Alternative selected layout will be created in the form of templates and 3 dimensions.
***Keywords**: Plant Layout, , SLP, Relationship Diagramming, MHES*

1. INTRODUCTION

PT. Elastis Reka Aktif (ERA PLASTIC) is one of the industry engaged in manufacturing plastics. Established in 1996, the product produced by PT. ERA PLASTIC is a consumer good by using technology extrusion blown film into plastic bags used everyday society.

Plastic bags help people in everyday life, especially for housewives who shop daily whether it is to the traditional markets, supermarkets, stalls, or small kiosks. But the ease of plastic bag making highly dependent housewives throughout its existence because it is very helpful and effective.

In 2014, PT. Plastic ERA wants to expand production to meet the needs of the market by opening a new plant, located on Jl. Raya Gema Lapik, South Cikarang Indonesia under the name Elite Recycling Extension (ERI Extension). The location of the new plant has a land area of 6000 m^2 and a building area of ± 2200 m^2. The problem in this research is PT. Plastic ERA requires the design of plant layout for PT. ERI Extension with the goal of maximizing the capacity of 300 tons / month with the size of the location is available and meets the criteria of a good layout. Limitation of problems used in this study is predetermined capacity and follows the shape of the land owned land.

2. LITERATURE REVIEW

Definition of Plant Layout

According Sritomo (2009, p67), the layout is a major cornerstone in the industrial world. Plant layout can be defined as a procedure for setting the plant facilities to support the smooth production process by utilizing the area for placement of machines or other production support facilities, the smooth

movement of material transfer, storage of materials, personnel work, and so forth.

Layout Type

According Wignjosoebroto (2009, p148) there are 4 (four) different types of layouts that are generally applied in the design layout, namely:

a) The layout of the facility is based on the flow of production (Product Layout)
   If a factory is specialized in producing a variety of products in the quantities or large volume and long production time.
b) Based Facility Layout Function or kinds Process (Process Layout)
   Generally used for the manufacturing industry working with relatively small production volumes and especially for the kind of products that are not standard.
c) Location Based Facility Layout Materials and Equipment (Fixed Position Layout)
   Production facilities such as machines, humans, and other components move towards the main product components that are in a fixed position. Example: aircraft, in sound of the sea, and others.
d) Facility Layout Based Products Group (Group Technology Layout)
   Grouping by step processes, forms, machines, and equipment used.

The characteristics of a Good Layout

According Hadiguna and Setiawan (2008, p15) in designing the plant layout criteria that there be the size of a good plant layout, among others:

a) The planned material flow patterns; This criterion is not intended that the material flow jumps or backward (backtrack)
b) The first operation close to the reception; This criterion aims to conserve the use of space and shorten the distance of displacement of material
c) The last operation close to delivery; This criterion aims to shorten the distance of displacement of material
d) Inventories of semi-finished goods or work in process (WIP) minimum; This criterion aims to achieve a balance trajectories in a way to avoid the buildup of WIP to the next process (bottleneck)
e) Control of noise, dirt, dust, smoke, and moisture is adequate; This criterion aims to maintain the Occupational Health and Safety (K3) for workers

Systematic Layout Planning (SLP)

A systematic and organized approach to planning the layout that was created by Richard Muther (1973) known as the Systematic Layout Planning (SLP). SLP diagram is shown in Figure 1.

Calculation of Number of Machines

According to Apple (1990), sheet production sequencing (routing sheet) is a tabulation of the steps are covered in producing certain components and details for related matters. The purpose of making the routing sheet is to know the number of machines or production equipment necessary to meet the desired production quantities by taking into account the percentage of scrap (waste), the engine capacity, and efficiency of the engine.

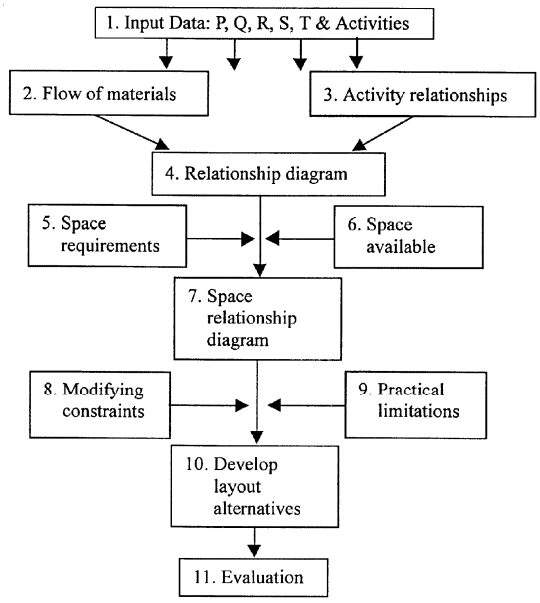


Figure 1. Diagram SLP

Activity Relationship Chart (ARC)

According Wignjosoebroto (2009, p 199-203), map relationships or activities Activity Relationship Chart (ARC) is a method or technique that is simple in the plan layout of the facility or department based on the degree of relationship that is often expressed in aktvitias assessment is subjective.

Algorithmic Approach Relationship diagraming

According to Tompkins (2nd edition, p295), ranked by proximity, placement between departments can use the algorithmic approach in which one example of the algorithmic approach is Relationship diagraming method. This method is the basis for constructing a new layout that prioritizes the department with the highest number of A. The required input is the activity relationship chart (ARC) and create a worksheet from the ARC as a basis for the construction activity relationship diagram (ARD).

Material Handling Checklist

Based on Material Handle Institute (MHI) removal of material covers all the basic operations include a large movement of goods and packaging in the form of solid area between machines in the workplace as a limit. Material handling checklist uses basic principles of chemical transfer rules, criteria for a good layout, and a checklist as a list of things that should be checked.

3. RESEARCH METHODOLOGY

Methodology is a major stages that must be done before doing research on the subject matter so that research can be carried out more targeted and easier in analyzing problems to fit the expected goals. Flowchart of research methodology can be seen in Figure 2.

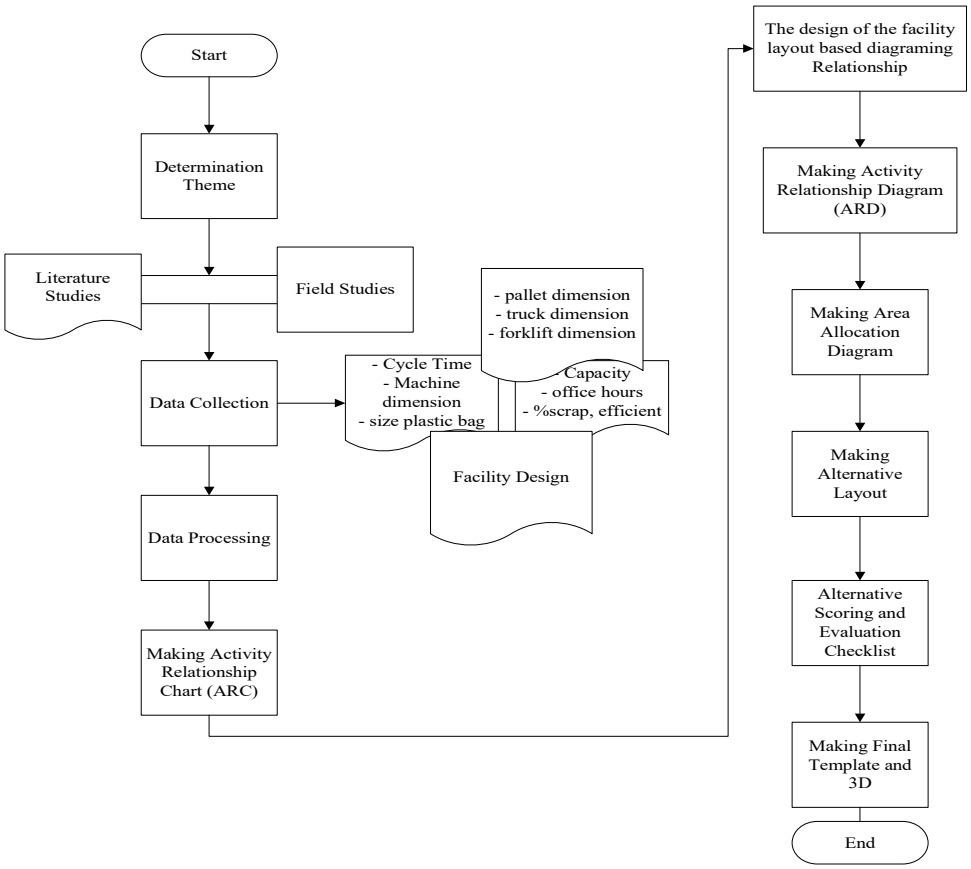


Figure 2. Flowchart of Research Methodology

4. DATA COLLECTION AND PROCESSING

Routing Calculation Sheet conducted to determine the number of machines in the production process needs the manufacturing of plastic bags. Calculation of the number of machines can be seen in Table 1.

Table 1. Calculation of Number of Machines

NAME OF THE MACHINE	THE NUMBER OF MACHINES NEEDED		
	Size 17 Cm	Size 24 Cm	Size 28 Cm
Mixer	1	1	1
Extrusion Blown Film	22		
Cutting and Sealing with auto puncher	4	3	2
workbench 1	1	0	0
workbench 2	1	1	1
workbench 3	1	1	1
workbench 4	1	1	1
workbench 5	1	1	1

In determining the amount of engine requirements, not all machines are summed and rounded up. At the cutting and sealing machine with auto puncher to a size of 17 cm requires 4 machine, size of 24 cm requires 3 machine, and for the size of 28 cm requires 2 machines. This is due to the machine that is used to a size of 17 cm different from the machine to the size of 24 cm and 28 cm. The difference lies in the puncher is used and waste generated. While the machine needs extrusion blown film can be summed and rounded up because the same machine used and its use can be set according to the type of plastic bags that want to produce.

After calculating the needs of the machine, proceed to the calculation of the floor area of the main floor area that is followed by the calculation of production and production supporting floor area that can be seen in Table 2.

5. FACILITY LAYOUT DESIGN

In planning the layout of the facility or the department tend to be based considerations are subjective of each facility or department. To simplify the design, made two (2) ARC where the division is based on the production room and in the plant area. Code given in the form of the letter A, E, I, O, U, and X are included reasons such as numeric code which is used is subjective reasons. Table descriptions reasons used are listed in Table 3. While examples Figure ARC and ARD plant service in the production of space can be seen in Figure 3.

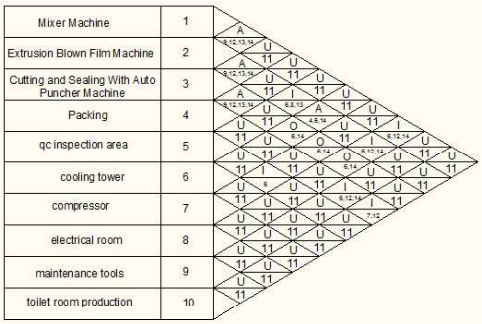
Table 2. Areas required for each facility

No	Floor Department	Area (m^2)
1	Mixer	54,9
2	Extrusion Blown Film	361,20
3	Cutting and sealing with auto puncher size 17 cm	127,76
	Cutting and sealing with auto puncher size 24 dan 28 cm	213,18
4	Packing Size 17 cm	77,19
	Packing Size 24 cm	59,44
	Packing Size 28 cm	37,35
5	Warehouse Raw Materials	40,04
6	Warehouse Supporting Materials	24,31
7	Finished Goods Warehouse	22,88
8	Receiving and Shipping	140
9	Office	70
10	Mosque	107,8
11	Waste Disposal	18
12	lockers	10,35
13	Security guards in the post	4,59
14	Heading guard Exit	3,49
15	Car Parking Area	116,89
16	Truck Parking Area	168
17	Motorcycle Parking Area	115,5
18	Electrical Room	112,01
19	Maintenance Tools	20,33
20	Toilet Room Production	16,88
21	Cooling Tower	9
22	QC Inspection area	9
23	Compressor	14,89
TOTAL		1959,94

Table 3. Description Reason for use

Reason Code	Description Reasons
1	use of notes together
2	using the same labor
3	using the same space area
4	work using the same equipment
5	carry out the same work activities
6	facilitate supervision
7	degree of contact personnel who often do
8	the degree of contact paper work that is often done
9	workflow sequence
10	the scent is disturbing
11	disturbing other activities
12	reduce the time delay
13	facilitate removal
14	facilitate coordination

From Figure 3, the ARC is based on subjective assessments to determine the closeness of the relationship between machines. As an example for the mixer machine and blow machine given the code letters A reason for having the sequence of work flow, reducing the time delay, easy removal, and facilitate coordination so that the mixer machine and blow machine should really take precedence. Unlike the mixer engine and cutting machines. Mixer machines and cutting machines are given a code letter U because it has reason to interfere with other activities and cut mixer machine is not important for approximated.
Furthermore displayed ARC, worksheets, and ARD Plant Service Outside the factory can be seen in Figure 4.



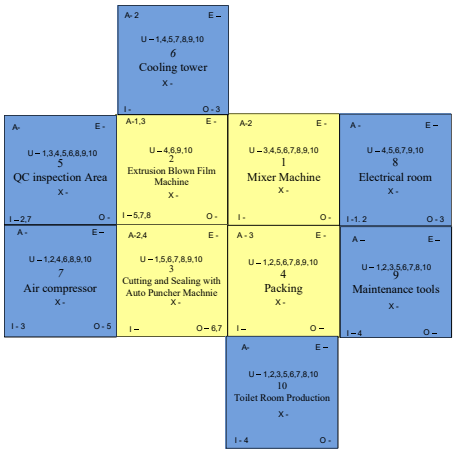
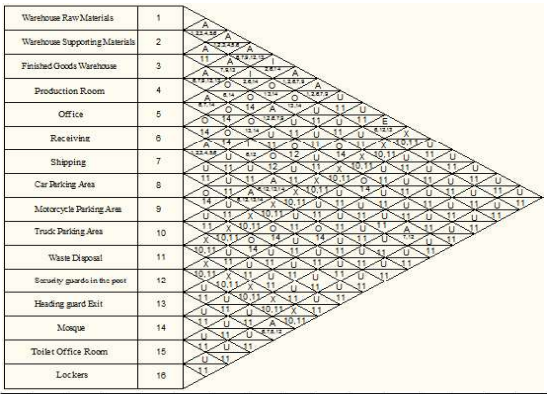


Figure 3. ARC and ARD with Space Plant Service In Production



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
A	2,3,4,6,7	1,3,4	1,2,4,7	1,2,3,5	4,15	1,7,10	1,3,6,10			6,7		16			5	12
E	10									1						
I	5	5			1,2			5								
O		6,7	5,6,10	6,7,12	3,6,7,9	2,3,4,5	2,4,5,13	9,12	4,5,8,12	3		4,8,9	7			
U	8,9,12,13 ,14,15,16	8,9,10,1 2,13,14, 15,16	8,9,12,133, 14,15,16	8,10,13, 4,15,16	8,10,12,1 3,14,16	8,9,12,13, 14,15,16	8,9,12,1 4,15,16	1,2,3,4,6 7,10,13, 14,15,16	1,2,3,6,7 ,10,13,1 4,15,16	2,4,5,8,9 ,12,13,14 ,15,16		1,2,3,5, 6,7,10,1 3,14,15	1,2,3,4, 5,6,8,9, 10,12,1 4,15,16	1,2,3,4, 5,6,7,8, 9,10,12, 13,15,1	1,2,3,4, 6,7,8,9, 10,12,1 3,14,16	1,2,3,4, 5,6,7,8, 9,10,13, 14,15
X	11	11	11	11	11	11	11	11	11	11	1,2,3,4,5, 6,7,8,9,1 0,12,13,1 4,15,16	11	11	11	11	11

Figure 4. ARC Plant Service Outside Plant and worksheets with ARC

The design of the plant outside the factory service using an algorithmic approach relationship diagraming where input needed is ARC then created a worksheet to facilitate the selection of the department to be put in blockplant. From Figure 5 known relationships between departments is a most departments namely Warehouse Raw Materials 1 (GBB) so that 1 is the first department in blockplant can be seen in Figure 5 (a). Furthermore, the election department for the second, third, and so on are made to the chart from the table that contains the combination of the degree of interest. Examples from to chart can be seen in Table 4.

Table 4. From to Chart Plant Service Outside with Factory

From to	1	TCR
1	0	0
2	A	32
3	A	32
4	A	32
5	I	8
6	A	32
7	A	32
8	U	2
9	U	2
10	E	16
11	X	1
12	U	2
13	U	2
14	U	2
15	U	2
16	U	2

From to	1	2	kombinasi	TCR
1	0	A	-	32
2	I	0	-	8
3	A	A	AA	64
4	A	A	AA	64
5	I	I	II	16
6	A	O	AO	36
7	A	O	AO	36
8	U	U	UU	4
9	U	U	UU	4
10	E	U	EU	18
11	X	X	XX	2
12	U	U	UU	4
13	U	U	UU	4
14	U	U	UU	4
15	U	U	UU	4
16	U	U	UU	4

From to	1	2	3	kombinasi	TCR
1	0	A	A	-	64
2	I	0	A	-	40
3	A	A	0	-	64
4	A	A	A	AAA	96
5	I	I	O	IIO	20
6	A	O	O	AOO	40
7	A	O	A	AAO	68
8	U	U	U	UUU	6
9	U	U	U	UUU	6
10	E	U	O	EOU	22
11	X	X	X	XXX	3
12	U	U	U	UUU	6
13	U	U	U	UUU	6
14	U	U	U	UUU	6
15	U	U	U	UUU	6
16	U	U	U	UUU	6

From to	1	2	3	4	kombinasi	TCR
1	0	A	A	A	-	64
2	I	0	A	A	-	40
3	A	A	0	A	-	64
4	A	A	A	0	-	
5	I	I	O	A	AIIO	52
6	A	O	O	O	AOOO	44
7	A	O	A	O	AAOO	72
8	U	U	U	U	UUUU	8
9	U	U	U	O	OUUU	10
10	E	U	O	U	EOUU	24
11	X	X	X	X	XXXX	4
12	U	U	U	O	OUUU	10
13	U	U	U	U	UUUU	8
14	U	U	U	U	UUUU	8
15	U	U	U	U	UUUU	8
16	U	U	U	U	UUUU	8

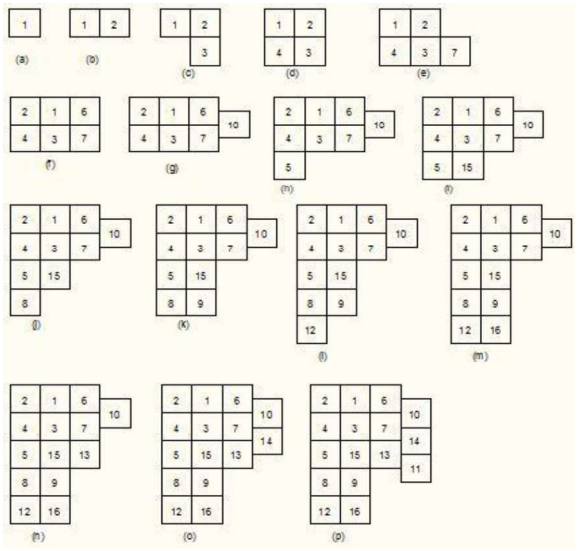


Figure 5. Blockplant Plant Service Outside with Factory

As an example from Table 4, it is found that the department was selected to blockplant 2 department because the department 2 has a relationship with department 1 and has the highest TCR of 32. Department subsequently selected to blockplant is 3 department because the department has a relationship 3 AA combination and have TCR the highest was 64. steps the same done to all the departments are elected to the blockplant which can be seen in Figure 4. at the time of entering into blockplant department, laying blockplant is clockwise (clockwise). The results of relationship diagraming method is Activity Relationship Diagram (ARD) which can be seen in Figure 6.

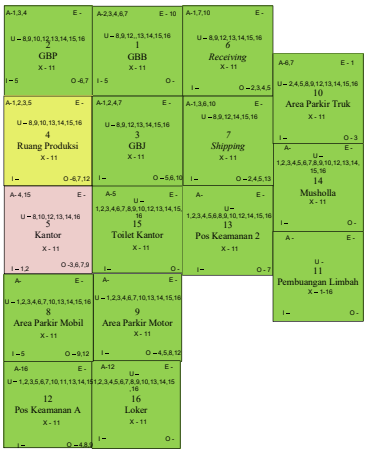


Figure 6. ARD Plant Service Outside with Plant

Results of selected ARD followed by making Area Allocation Diagram (AAD) blockplant where this blockplant AAD use in the conversion of the area into the templates area. Figure AAD blockplant can be seen in Figure 7.

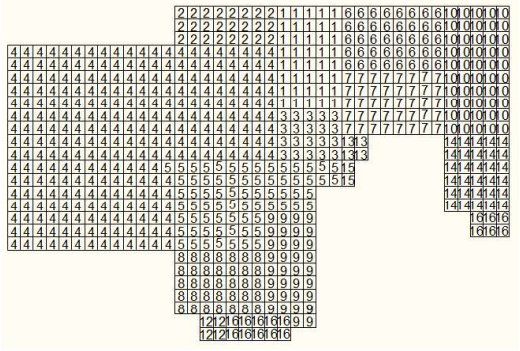


Figure 7. AAD Blockplant Plant Service Outside with Factory

Because of the available land has limited the development of alternative layouts created an alternative that can be seen in Figure 8.

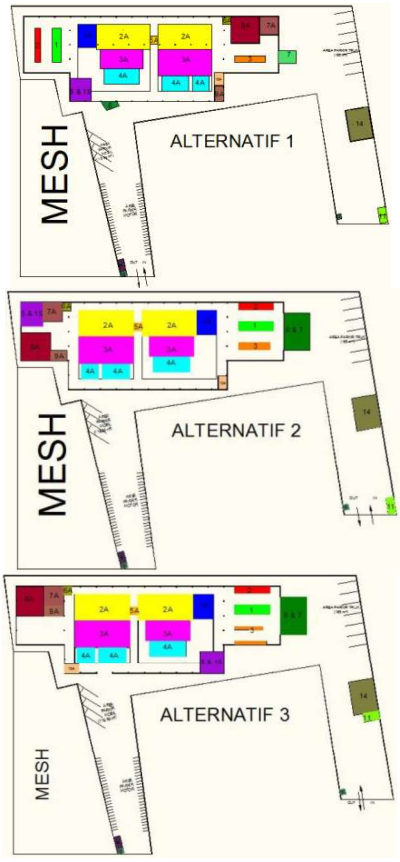


Figure 8. Development Alternative Layout

6. EVALUATION OF LAYOUT

Evaluations were conducted to evaluate the layout design of the layout of the plant facility by adjusting the available land. How to evaluate the layout is done with two (2) ways, namely by using a scoring quantitatively and qualitatively using the Material Handling Checklist. The first method uses a scoring method which used the code letters have numeric values, namely:

A has value 2^5
E has value 2^4
I has value 2^3
O has value 2^2
U has value 2^1
X has value 2^{-1}

If the borders between departments directly, then multiplied by 1. Conversely, if the borders between departments not directly, then multiplied by 0. Results of calculation of scoring alternative development layout can be seen in Table 5.

Based on Table 5 the results obtained from the calculation of an alternative scoring for 1, 276, Alternative 2 is 270, and the alternative 3 is 506.

Table 5. Results Scoring Alternative Development Layout.

Department	Alternative 1	Alternative 2	Alternative 3
1	32	80	80
2	16	52	52
3	33	68	68
4	52	49	66
5	34	16	32
6	4	52	52
7	32	66	66
8	1	3	3
9	5	3	3
10	17	33	33
11	0	0	1
12	16	16	16
13	0	0	0
14	0	0	1
15	17	16	17
16	17	16	16
Grand total	276	470	506

While the second method, an alternative layout is qualitatively evaluated by using a checklist of material handling. The results of the evaluation using a checklist of material handling can be seen in Table 6.

Table 6. Material Handling Checklist

Material Handling Checklist							
Number	**Criteria of Good Facility Layout**	**Alternative 1**		**Alternative 2**		**Alternative 3**	
		Yes	**No**	**Yes**	**No**	**Yes**	**No**
1	linkage activities planned	✓		✓		✓	
2	planned material flow patterns	✓		✓		✓	
3	Flow straight		✓	✓		✓	
4	step back (backtrack) minimum	✓		✓		✓	
5	additional flow paths		✓		✓	□	
6	straight alley	✓		✓		✓	
7	displacement between the minimum operating		✓		✓	□	
8	planned removal method	✓		✓		✓	
9	minimum displacement distance		□		□		✓
10	processing combined with the removal of material		✓		✓		✓
11	removal of moving toward acceptance of delivery	✓		✓		✓	
12	The first operation near the reception circuitry		✓	✓		✓	
13	last operation close to delivery	✓		✓		✓	

Table 6. Material Handling Checklist

Material Handling Checklist							
Number	**Criteria of Good Facility Layout**	**Alternative 1**		**Alternative 2**		**Alternative 3**	
		Yes	**No**	**Yes**	**No**	**Yes**	**No**
14	storage usage on the spot if possible	✓		✓		✓	
15	Flexible layout	✓		✓		✓	
16	able to accommodate future expansion plans	✓		✓		✓	
17	semi-finished goods inventory or minimum WIP	✓		✓		✓	
18	minimum of material being processed	✓		✓		✓	
19	maximum use of the entire production floor		✓		✓		✓
20	sufficient storage space	✓		✓		✓	
21	provision of sufficient space between equipment	✓		✓		✓	
22	buildings erected around the layout	✓		✓		✓	
23	materials delivered to the workers and taken from work		✓		✓		✓
24	as little as possible on foot between production operations		✓		✓		✓
25	proper placement services for production facilities and workers	✓			✓	✓	
26	mechanical switching apparatus installed in the appropriate place	✓		✓		✓	
27	service function enough workers	✓		✓		✓	
28	noise control dirt, dust, smoke, and moisture is adequate	✓		✓		✓	
29	processing time for a maximum total production time	✓		✓		✓	
30	minimize the transfer of materials	✓		✓		✓	
31	Minimum redeployment	✓		✓		✓	
32	separator does not interrupt the flow of materials and goods	✓		✓		✓	
33	material removal by a machine operator directly as possible	✓		✓		✓	
34	reduce the disposal of waste materials		✓		✓		✓
35	appropriate placement for the receipt and delivery		✓	✓		✓	
Total Yes		24		26		29	
Total No		11		9		6	

Material Handling Checklist of evaluation using 35 criteria nice layout obtained results for each alternative. The first alternative with a total of 23 yes votes and a total of not as much as 12. Alternative second with a total of 25 yes votes and a total of not as much as 10. Third alternative with a total of 28 yes votes and a total of not as much as 7. Therefore, a third alternative was selected and showed that alternative the third most applicable.

In the third alternative is not as much as there are a total of 6. These results prove

the three alternative designs have limitations as 6 criteria, namely:

1) The minimum displacement distance
2) processing combined with the removal of material
3) the use of the entire production floor maximum
4) materials delivered to the workers and taken from work
5) as little as possible on foot between production operations
6) reduce the disposal of waste materials

Minimum displacement distance criteria, combined with the removal of material processing, material transfer criteria to be taken from the workers and the workplace, and as little as possible on foot between production operations are given a checklist is not due to the condition of the material using the displacement and the displacement of tools and materials such as trolley dolly. This condition can be treated by using a conveyor or conveyor belt so that the operator does not have to waste time to move the processed materials. But the other one hand, companies should consider in terms of finance to use conveyor.

Criteria for the maximum use of the entire production floor is given a checklist is not due to the condition of the production floor is not made of two levels. These criteria can be addressed by increasing the production capacity so that the need for the engine to produce more.

Criteria reduce the disposal of waste materials checklist is not given because of the condition of the factory plastic bag certainly result in residual form of scrap and waste, but this plant already has a solution to cope with scrap and waste. Scrap and waste plastic bags collected and then transferred to ore recycled into plastic recycle plastic bags so it can be used again.

7. CONCLUSION

Based on the stage of the plant layout design using SLP approach, to design the factory plastic bag with a capacity of 300 tons / month obtained the layout type of product layouts include:

1) Facilities production floor, with a floor area of 931.02 m^2 production consists of three (3) main engine which includes: area of mixer machine, extrusion machine area blown film cutting and sealing machine area with auto puncher, and packing area
2) Facilities supporting the production floor, with a total area of 1028.92 m^2 which includes: Raw Material Warehouse, Warehouse Supporting Materials, Finished Goods Warehouse, Shipping and Receiving, Office, office toilets, mosque, waste disposal, security entry Pos, Pos guard out, Lockers, car parking, motorcycle parking, truck parking, maintenance tools, Cooling towers, Qc inspection area, Compressor, and Toilet production space

After the calculation of floor area for the production floor facilities and supporting the production floor, the layout design was developed into three alternative design layout. Alternative layout then quantitatively evaluated by scoring method and evaluated qualitatively with material handling checklist sheet. From the evaluation performed quantitatively and qualitatively, the third alternative is the alternative layout was selected to proceed to the creation of templates and 3D. Although no third alternative has a total of as much as 6, a third alternative is best layout to be applied because it meets kriterira good layout.

8. REFERENCES

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