

EFFORTS TO IMPROVE THE QUALITY OF DRUG PACKAGING BY IMPLEMENTING QUALITY FUNCTION DEPLOYMENT (QFD)

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ABSTRACT

Abstract: In a manufacturing industry, quality products are one of the most important parts. At present there are many companies engaged in printing medicine and food packaging. Packaging is one of the most important factors because of its function and use in improving product quality and selling power of a drug. The level of competition in the field of industry is getting tougher, it encourages PT. XYZ to develop new products and to improve the quality of existing products. One of the new products that will be developed by PT. XYZ using the Quality Function Deployment method is a type of Polycellonium strip packaging. From HoQ Level 1, it is found that the quality of raw materials is the Technical Requirement with top priority. Then the next analysis is carried out again to HoQ Level 2 to find the Process Requirement and Inspection of Jumbo Lamination after curing is a top priority. From the results of the analysis of HoQ 2, the analysis is continued to HoQ 3, which is Quality Procedure and it is found that the training refreshment procedure once every 6 months is a top priority that can be developed by the company.

Keywords: product development, manufacture, medicine packaging, Quality Function Deployment.

1. INTRODUCTION

The product is the output obtained from a production process (transformation) and is the addition of value from raw materials and is a commodity sold by the company to consumers [1]. Product design and development are all processes related to the existence of products which include all activities ranging from identification of consumer desires to fabrication, sales and delivery of

products. Product design and development is part of an innovation process that exists in the business world. Through product design and development, it is hoped that new product innovations will be able to provide certain advantages in overcoming competition with competitor products. [2]. At present there are many companies engaged in printing medicine and food packaging. Packaging is one of the most important factors because of its function and use in improving product quality and selling power of a drug [3]. The level of competition in the industry is getting tougher, this is encouraging drug packaging printing companies to develop new products and to improve the quality of existing products. In efforts to improve quality product, PT. XYZ needs to identify characteristics of consumer needs. Process identification of consumer needs aimed at know the important attributes and relates to customer satisfaction as a basis for development next product.[4]

One of the new products to be developed is the Polycellonium strip packaging. This type of packaging has many advantages over other types of packaging and is quite attractive to some consumers from leading drug companies [5]. Polycellonium is the material for the most common drug strips containing polycello / cellophane and aluminum layers. Both types of layers have their respective functions to protect the packaged drug. The specifications of the resulting Polycellonium packaging must also be seen from the side of the stripping and branding machine of the consumer (drug manufacturer). Consumer satisfaction is a major issue that must be done in-depth study, so we must know the extent to which consumers get a sense of satisfaction from services and products. Customer satisfaction can be measured by various methods. In this case it can be done by using the QFD (Quality Function Deployment) method development. With the application of this method the company is expected to meet the desires of consumers so they can provide the best products and can survive in the

market [6]. The problem that occurs in the object of this research is that the polycellonium packaging has not been used on this product, so it is necessary to conduct a study to innovate the development of packaging products made from polycelloniumu to fulfill consumer demand.

The objectives of this research are: finding out what attributes are the needs of consumers for polycellonium type drug packaging products. And developing products with the QFD method

2. Research Methodology

The planning and development phase of the QFD model can also be called a matrix, while the planning and development matrix of QFD is as follows [7]:

1. Product / House of Quality / HOQ Planning Matrix. HOQ is better known as the first house (R1), which explains about customer needs, technical requirements, co-relationships, relationships, customer copetitive evaluation, competitive technical assessment and budgeting. HOQ consists of 7 main parts.
2. Part Deployment Matrix. Better known as the second house (R2) is a matrix to identify technical factors that are critical to product development.
3. Process planning matrix (R3) which is a matrix to identify the development process of making a product
4. Manufacturing / Production / Manufacturing Production Planning Matrix. Better known as the fourth house (R4), which describes the actions that need to be taken in improving the production of a product.

3. Data Collection and Processing

Data Collection

The data collected can be described as follows:

- A. Primary data. Primary data is collected by direct observation or measurement, namely:
 1. Open questionnaire data
 2. Closed questionnaire data
 3. Technical characteristics
 4. Critical Part
 5. Product Structure
- B. Secondary data. Secondary data were obtained by interviewing the production department and company documentation data, including:
 1. Production process sequence for Polycellonium packaging products.
 2. Technical characteristics
 3. Production data includes the production process.

The number of respondents in this closed questionnaire was 16 customers. Desires or expectations of customers identified for the attributes can be seen in the following Table 1:

Table 1 Attributes of Polycellonium Packaging

No	Packaging Atributes
1.	Packaging dimansion
2.	Thickness of pakagung
3.	The packaging is not wringled
4.	Ink does not come off
5.	Packaging color
6.	Packaging text
7.	Packaging Design
8.	The packaging does not smell pungent
9.	Easy to cut packaging
10.	Packaging weight
11.	Packaging slippage
12.	No delamination
13.	Compliteness of analysis certificate
14.	Packaging packing

Data Processing

Validity and Reliability Test

Test the validity of using SPSS 16.0 software [8]. Variable is declared valid if the value of r is calculated $\geq r$ table. In this case r table if the significance level is 5% and the degree of freedom $db = n-2$, n is the number of questionnaires (16) then $db = n - 2 = 16-2 = 14$, obtained r table = 0,532.

After testing, in Corrected Item-Total Correlation it turns out that only 2 items have a value of $r < r$ table, that is, 14 items question Packaging Attributes have a value $r > r$ table, then all 14 Packaging Attributes are valid From the reliability test results obtained a Cronbach Alpha value of 0.924. Then $0.924 > 0.60$ so that this questionnaire is reliable or reliable

Building a House of Quality (HOQ) Matrix

The steps that must be carried out in the process of forming the HOQ matrix are as follows :

1. Customers identification
 2. Determine the Level of Interest Attributes
 3. Develop a planning matrix
 4. Establish Technical Requirements for Consumer Needs
 5. Establishing Relationships Between Technical Requirements
 6. Establish the Level of Relationship Between the Technical Characteristics of Products and Consumer Desires
 7. Building the House of Quality (HOQ) Matrix
- Based on the data obtained in the previous steps, the HoQ level 1 matrix is then made as shown in Figure 1 below

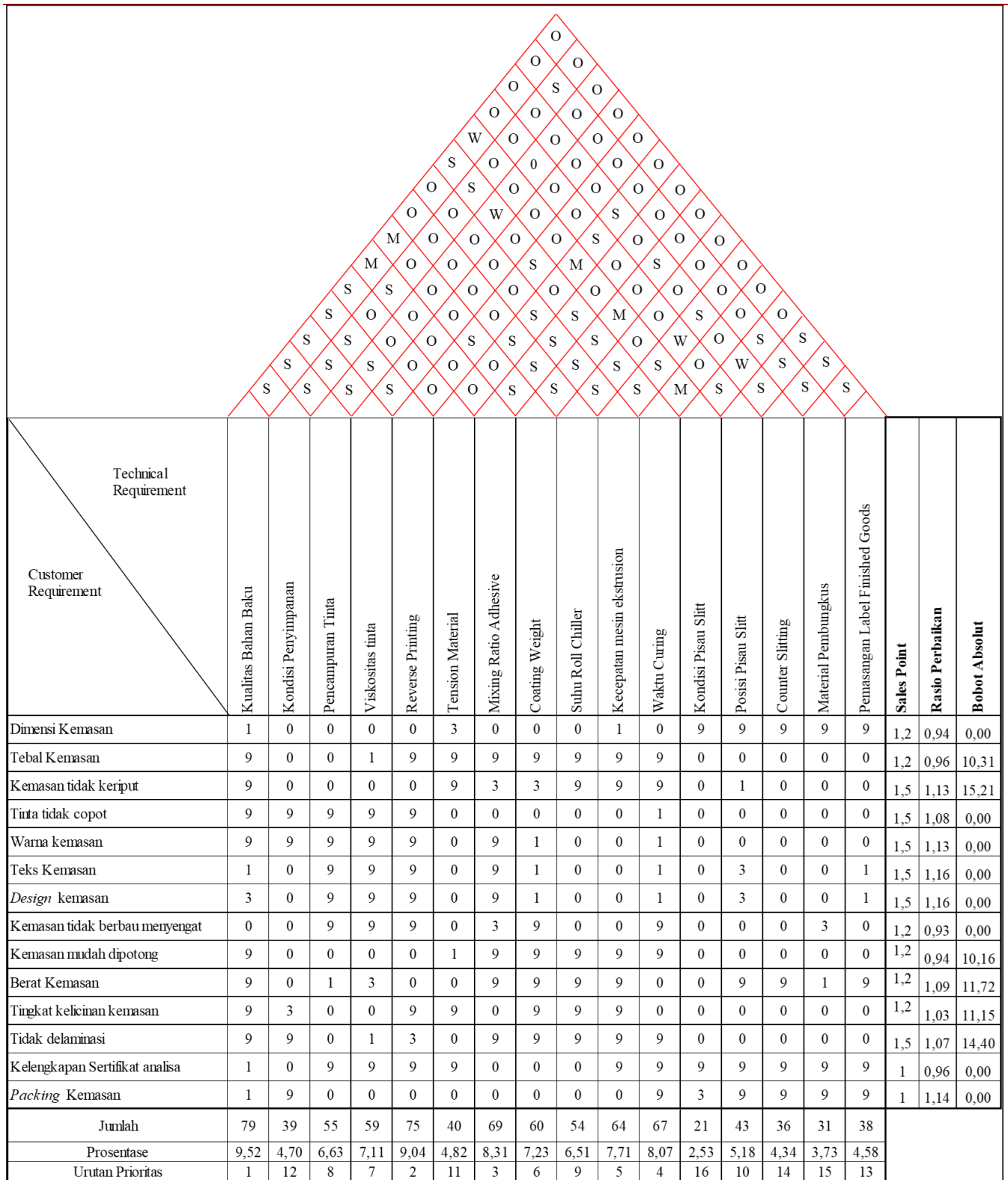


Figure 1. HOQ Matrix

Establish Phase II Quality Function Deployment (QFD)

The House of Quality technical matrix to process requirements is the second stage of the QFD stage. This matrix input is obtained from the previous matrix output,

namely technical requirements (technical parameters) and the value of the Degrees of Interest which will be the normalization of weights. The stepd are following [9]

1. Weigth normalization
2. Requirement process

3. Interaction of Technical Characteristics with Process Needs
 4. Value of Technical Requirements with Process Requirements
 5. Relationship Between Process Requirements
- This House of Quality matrix explains what are the technical parameters and how to fulfill them. This matrix

is made based on the merging of data processing from determining the normalization of weights to the interaction of process needs, but the results of this matrix cannot yet be determined in the company's operations. Based on the data obtained in the previous steps, the HoQ level 2 matrix is then made as shown in Figure 2 below.

Process Requirement	Bobot	Quality Procedure																	
		Inspeksi Bahan Baku konsisten setiap kali kedatangan	Bahan baku berbentuk cair di jaga suhu maksimasi 24 °C	Harus ada Progressive Standar Warna saat validasi printing	Pemeriksaan Viskositas tinta 15 menit/sekali	Menggunakan Material Cetak SPET atau MSAT	Printing di bagian Corona treatment	Adhesive dan hardener berbanding 80 : 20	Coating Weight antara SPET/MSAT dan Aluminium 1,2-2 gr/m ²	Speed mesin ekstrusion 60 km/jam untuk ketebalan 20 µm	Waktu curing tidak boleh kurang dari 6 jam	Nilai sealing strength > 800 gf/15 mm	Nilai bonding strength > 120 gf/15 mm	Folding test tidak ada bubble	Setiap pengukuran menggunakan alat yang sudah dikalibrasi	Hasil stripping putus tidak ada serabut	Menerapkan Line Clearance	Training refreshment prosedur 6 bulan sekali	Menurunkan speed dan tension jika material bergelombang
Inspeksi Bahan Baku sebelum digunakan produksi	8,29	74,6	74,6	24,87	74,6	74,6	74,6												
Penyimpanan berdasarkan jenis material dan FIFO	5,54	5,537	49,83	5,537	49,83			49,83											
Menggunakan material yang Easy Tear	3,04	27,39				27,39	27,39									27,39			
Melakukan Validasi sebelum produksi printing	5,51	49,57	49,57	49,57	49,57		49,57							49,57			16,52	49,57	
Pengukuran Viskositas Tinta sebelum dan saat produksi berlangsung	7,41	66,7	66,7	66,7	66,7		7,412									66,7	22,23	66,7	
Penimbangan Coating Adhesive sebelum produksi	8,35							75,18	75,18	25,06	75,18	75,18	75,18	75,18	75,18	75,18	75,18	75,18	
Pengaturan Speed Mesin Ekstru sesuai thickness	10,93					98,35		98,35	98,35	98,35	98,35	98,35	98,35	98,35	98,35	98,35	98,35	98,35	98,35
Pengaturan Tension Material sesuai kondisi material	8,61	25,82				77,46		77,46	77,46							77,46	77,46	77,46	
Inspeksi Jumbo Laminasi setelah curing (folding, sealing, bonding dan thickness)	15,10	135,9		135,9	135,9	135,9	135,9	135,9		135,9	135,9	135,9	135,9	135,9	135,9	135,9	135,9	135,9	135,9
Pengukuran Lebar hasil slitting	3,88														34,88			34,88	34,88
Pengukuran Diameter per Roll Finished Goods	6,79	61,11						61,11	61,11						61,11			61,11	
Inspeksi Stripping Material hasil ekstrusion	12,18	109,6				109,6	109,6	109,6	109,6	109,6	109,6	109,6	109,6	109,6	109,6	109,6	109,6	109,6	109,6
Proses packing satu produk dalam satu waktu	4,38					4,381											39,43	39,43	
Jumlah		556,2	240,7	282,5	376,6	527,7	404,5	468,9	557,6	371,6	468,9	419	419	419	497,9	598,5	78,19	822,8	456,2
Prosentase		6,983	3,022	3,547	4,727	6,624	5,078	5,886	7,00	4,665	5,886	5,26	5,26	5,26	6,251	7,513	0,982	10,33	5,727
Urutan Prioritas		4	17	16	14	5	13	8	3	15	7	10	11	12	6	2	18	1	9

Figure 2. HOQ level 2 matrix

Establish Quality Function Deployment (QFD) Phase III

The House of Quality Matrix explains what the process requirements are and how to fulfill them. This matrix is

made based on the merging of data processing from determining the normalization of weights to the interaction of quality procedures, the results of this matrix can already be determined in the company's operations.

This is because the output of this matrix is in the form of quality procedures which are a series of technical procedures in PT. XYZ in detail, measurable and

concrete. The complete picture of this HOQ matrix is shown in Figure 3 below.

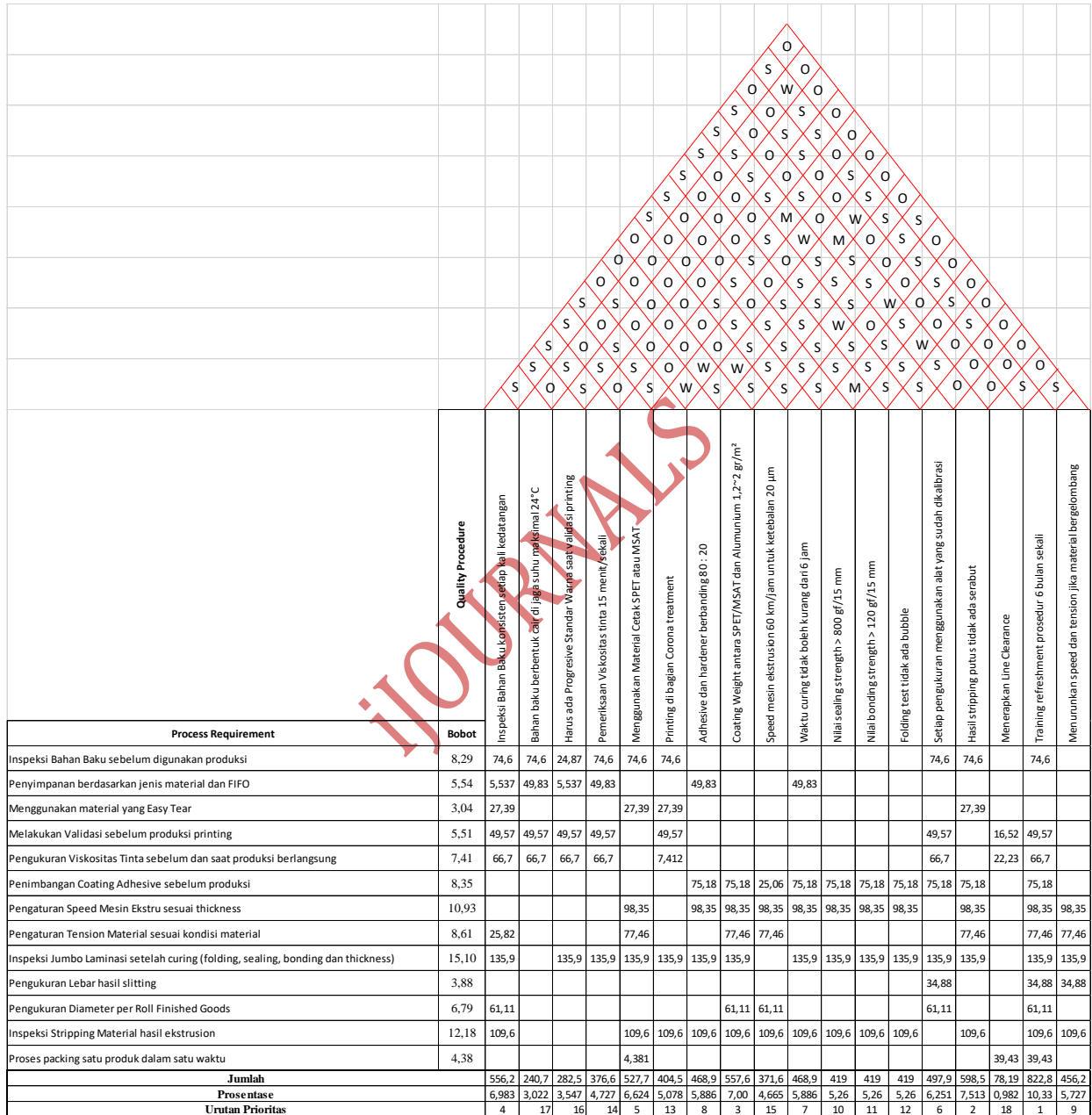


Figure 3. HOQ Matrix level 3

4. Conclusion

The conclusions that can be drawn from this study are:

1. House Of Quality Level 1. From the questionnaire distributed to 16 respondents obtained 14 items of Packaging Attributes as Customer Needs. To be able to meet the Customer Requirements, 16 Technical Requirements are determined. From the relationship between Customer Requirements and Technical Requirements we can focus on the 5 most important

priority items namely Raw Material Quality, Reverse Printing, Mixing Adhesion Ratio, Curing Time, and Extrusion machine Speed. Therefore the main priorities above can be determined into Technical Requirements which are priorities to be developed first.

2. House Of Quality Level 2. Attributes of the Technical Requirements contested 16 are then announced into 13 Process Requirements. The need for this process is

determined by the research object company. From the relationship between Technical Requirements and Process Requirements, we can focus on the 5 most important priority items namely Jumbo Inspection of Laminates after curing (folding, sealing, bonding and thickness), Stripping Materials Inspection of extruded results, Extruding Machine Speed Adjustment according to thickness, setting Tension Material according to material conditions, and Weighing of the Coating Adhesive before production. Therefore the main priorities above can be determined into Process Requirements which are priorities to be developed beforehand.

3. House Of Quality Level 3. Process Requirements Attributes that won 13 are then announced into 18 Quality Procedures. Quality Procedure Attribute is determined by the company to respond to customer desires that have been formed in the Process Requirements attribute. From the relationship between the Process Requirements and the Quality Procedure, we can focus on the top 5 priority items, namely the 6-month refresher training procedure, the results of stripping without fiber, the weight of the coating between the SPET / MSAT and the Aluminum 1.2 ~ 2 gr / m², Inspection of Raw Materials every time you visit, and Using SPET or MSAT Printing Materials. Therefore the main priorities above can be determined as a Quality Procedure which is a priority to be developed first.
4. Development for packaging as follows:
 - a. The printing process uses SPET or MSAT material using the Reverse Printing system, which is the print or ink position in the PE sandwich section. Printed with a machine with Rotogravure system. So that the prints can last a long time and the packaging does not cause a pungent odor. SPET and MSAT materials are also easier to cut.
 - b. For thick PE sandwich used is 20 µm. With this thickness the bonding value between SPET / MSAT with PE and PE with ALU is quite high at ≥ 120 gf / 15mm. The packaging is still easy to cut and the results are not stringy stripping.
 - c. The ALU used is 12 µm in thickness and 15 µm in thickness. With the thickness of the ALU the barrier to protecting drugs is good enough, one of them is protection from water vapor and influences the drug expiration period. If the ALU used is too thin it will affect the results of packaging that is easily wrinkled during the production process.
 - d. The sealing part of the packaging used is PE or EAA material with a thickness of 35 µm. With this

thickness, it shows a good Sealing Strength value yaitu 700 gf / 15mm. This can prevent material leakage.

5. ACKNOWLEDGMENTS

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