

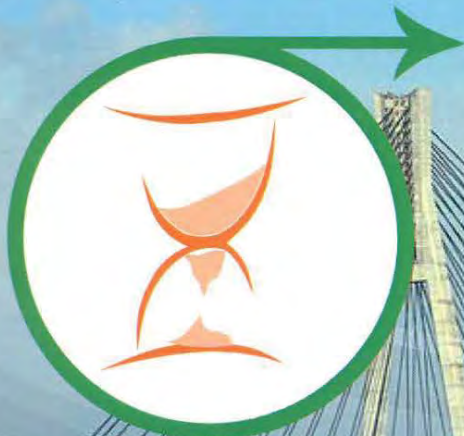
ISSN : 1978-774X

Vol.6, 2013

Proceeding

**6th INTERNATIONAL SEMINAR ON INDUSTRIAL
ENGINEERING AND MANAGEMENT (6th ISIEM)**

*"Sustainable innovation on enhancing
industrial management, technology, and information"*



ISIEM



Harris Hotel Batam Center, Batam, Indonesia
February 12th - 14th, 2013

Organized by:



PASUNDAN UNIVERSITY



Universitas Al Azhar Indonesia



TRISAKTI UNIVERSITY



PTJMA JAWA

Supported by:



UNTAR
Universitas Tarumanagara



Universitas
Esa Unggul



1978-774X



11 MAR 2013

ISSN : 1978-774X

Proceeding

The 6th International Seminar
on Industrial Engineering and Management (6^h ISIEM)

Harris Hotel Batam Center, Batam, Indonesia
February 12th – 14th, 2013

Organized by :
Industrial Engineering Department of



UAI
Universitas Al Azhar Indonesia

Universitas
Esa Unggul



UNTAR
Universitas Tarumanagara



Supported by :

istmi



Indonesian Industrial Engineering
Higher Education Association



11 MAR 2013

ISSN : 1978-774X

Proceeding

The 6th International Seminar
on Industrial Engineering and Management (6^h ISIEM)

Harris Hotel Batam Center, Batam, Indonesia
February 12th – 14th, 2013

Organized by :
Industrial Engineering Department of



UNTAR
Universitas Tarumanagara



Supported by :



Indonesian Industrial Engineering
Higher Education Association

FOREWORD

In this 6th International Seminar on Industrial Engineering and Management (ISIEM) Seminar issues is **Sustainable on Enhancing Industrial Management, Technology, and Information**, and wide area of Industrial Engineering including Quality Engineering, Supply Chain Management, Production System, Operation Research, Decision Support System, Ergonomics, Artificial Intelligent, Industrial Management, and Entrepreneurship.

All of papers received were review by a peer of reviewers and published for 55 papers from various Indonesian University and abroad, and be presented by 52 presenters.

Historical, the ISIEM is an annual seminar event organized by 6 universities that run Industrial Engineering Department, which are Triskati University Jakarta, Atmajaya Catholic University Jakarta, Tarumanagara University Jakarta, Esa Unggul University Jakarta, Al-Azhar Indonesia University Jakarta, and Pasundan University Bandung. The seminar took different places annually in all over Indonesia.

I would like to thank you to all committees for the efforts, all Reviewers, Mr. Predeep Nair from Schneider Manufacture Batam, Prof. Dr. Rosnah Mohd. Yusuff from Department of Mechanical and Manufacturing Engineering Universiti Putra Malaysia, Prof. Frits Blessing from Rotterdam University/Rotterdam Business School, for the Keynote Speeches, all Participants to join the Seminar, and everybody who helped us to make this seminar happen.

At last, enjoy your stay in Batam and have a good Seminar.

Ir. Wahyukaton, MT.
(Pasundan University Bandung)

Chairman of Committee

COMMITTEE

Steering Committee

1. Iphov Kumala Sriwana, ST, MSi (Esa Unggul University, Indonesia)
2. Dr. Dadang Surjasa, SSi, MT (Trisakti University, Indonesia)
3. Vivi Triyanti, ST, MSc (Atma Jaya Jakarta Catholic University, Indonesia)
4. Dr. Ir. Syarif Hidayat, MEng.Sc, MM (Al Azhar Indonesia University, Indonesia)
5. Ir. Toto Ramadhan, MT (Pasundan University, Indonesia)
6. Dr. Lamto Widodo ST, MT (Tarumanagara University, Indonesia)

Organizing Committee

- Chair** Ir. Wahyukaton, MT (Pasundan University, Indonesia)
Co-Chair Nunung Nurhasanah, ST, MSi (Al Azhar Indonesia University, Indonesia)
Secretary Dr. Lamto Widodo ST, MT (Tarumanagara University, Indonesia)
Treasury Iphov Kumala Sriwana, ST, M.Si (Esa Unggul University, Indonesia)

Proceeding Editor

- Rahmi Maulidya, ST, MT (Trisakti University, Indonesia)
Endro Wahyono (Tarumanagara University, Indonesia)

Leaflet

- Dr. Lamto Widodo ST, MT (Tarumanagara University, Indonesia)
Dr. Adianto, MSc (Tarumanagara University, Indonesia)
Rahmi Maulidya, ST, MT (Trisakti University, Indonesia)

Sponsorship

- Rina Fitriana, ST., MM. (Trisakti University, Indonesia)

Conference Organizer

- Ir. Syarif Hidayat, MEng, MM (Al Azhar Indonesia University, Indonesia)
Lina Gozali, ST, MM (Tarumanagara University, Indonesia)
Riya Widayanti, SKom, MKom (Esa Unggul University, Indonesia)

Accommodation

- Vivi Triyanti, ST, MSc (Atma Jaya Jakarta Catholic University, Indonesia)
Feliks Prasepta, ST, MT (Atma Jaya Jakarta Catholic University, Indonesia)
Marsellinus Bachtiar, ST, MM (Atma Jaya Jakarta Catholic University, Indonesia)
Yoseph Ole (Atma Jaya Jakarta Catholic University, Indonesia)

Website

- Ir. Yogi Yogaswara, MT. (Pasundan University, Indonesia)
Galih Ferdi Firmansyah (Pasundan University, Indonesia)

REVIEWER

1. **Prof. Ir. I Nyoman Pujawan, MEng, PhD**
(Sepuluh Nopember Institute of Technology, INDONESIA)
2. **Prof. Ahmad Syamil, Ph.D.**
(Arkansas University, USA)
3. **Prof. Erry YT Adesta, Ph.D.**
(International Islamic University of Malaysia, MALAYSIA)
4. **Assoc.Prof. Dr. Chuvej Chansa-Ngavej**
(Shinawatra University, THAILAND)
5. **Dr. Ir. Sri Gunani Pertiwi, MT.**
(Sepuluh Nopember Institute of Technology, INDONESIA)
6. **Dr. Dadang Surjasa, SSi, MT**
(Trisakti University, INDONESIA)
7. **Dr. Ir. Triwulandari SD, MM**
(Trisakti University, INDONESIA)
8. **Dr. Ir. Lily Amelia, M.Agr., M.M.**
(Esa Unggul University, INDONESIA)
9. **Dr. Ir. Nofi Erni, M.M.**
(Esa Unggul University, INDONESIA)
10. **Prof. Dr. Hadi Sutanto**
(Atma Jaya Jakarta Catholic University, INDONESIA)
11. **Prof. Dr. Weggie Ruslan**
(Atma Jaya Jakarta Catholic University, INDONESIA)
12. **Prof. Dr. Ir. S. Sardy, M.Eng.Sc**
(Al Azhar Indonesia University, INDONESIA)
13. **Dr. Ir. Hj. Tjutju Tarlih Dimyati, MSIE**
(Pasundan University, INDONESIA)
14. **Dr. Ir. Hj. Arumsari, MSc**
(Pasundan University, INDONESIA)
15. **Dr. Lamto Widodo ST. MT**
(Tarumanagara University, INDONESIA)

TABLE OF CONTENT

Foreword
Committee
Reviewer
Agenda
Table Of Content

QM – Quality Engineering & Management

No	Title and Author	Page
1	Design Of Water Quality Model To Support The Indonesian Healthy Project <i>Ratih Setyaningrum, Dwi Eko Waluyo</i>	QM – 1
2	Analysis Service of Satisfaction of Intercity Bus With IPA and CSI Method <i>Dyah Rachmawati L, Trismi Ristowati, Mohammad Khoeruddin</i>	QM – 6
3	Quality Analysis Using Fmea Method On Assembly Processes Of Washing Machine (Case Study In Panasonic Manufacturing Indonesia) <i>Rifa Arifati, Ardika Rismayana</i>	QM – 11
4	Pre Travelling Service Quality Analysis at Rail Station Commuter Jakarta-Bogor <i>Pudji Astuti, Winnie Septiani, Amal Witonohadi</i>	QM – 16
5	Integrating Kansei Engineering And Customer Relationship Management To Improve Service Quality: A Case Study At Shopping Mall In Surabaya <i>Markus Hartono, Rosita Meitha, Grandy Ongkowijoyo</i>	QM – 21
6	The Impact Of Perceived Service Quality on Customer Satisfaction And Loyalty: Case Study at Supermarket in Surabaya <i>Rosita Meitha Surjani, M.Arbi Hadiyat, Vanessa Gautama</i>	QM – 27
7	Quantitative Approach to Measure Process Connectivity in Balanced Scorecard Model <i>Vivi Triyanti</i>	QM – 34
8	Path Analysis To Assess Interaction Among Tracer Study Factors <i>Vivi Triyanti</i>	QM – 42
9	Consumer Preferences and Quality Perception of Imported and Domestic Apple in Surabaya <i>I Gede Agus Widyadana, Tanti Octavia, Herry Christian Palit, Dick Felix Wibowo</i>	QM – 48

SCM – Supply Chain Management

No	Title and Author	Page
1	Knowledge Management System Model in DKI Jakarta Rice Supply Chain <i>Dadang Surjasa, Dedy Sugiaro, Binti Solihah, Nirdukita Ratnawati</i>	SCM – 1
2	A Design Experiment To Evaluate The Effect Of Demand Pattern Into The Lot Sizing Performance <i>Arum Sari, Ulista Feriana</i>	SCM – 9
3	Supply Chain Management Performance Measurements in Oil Company <i>Tiena Gustina Amran</i>	SCM – 15

SCM – Supply Chain Management

No	Title and Author	Page
4	Applying Netlogo Simulation Model To Balance The Upstream Palm Oil Supply Chain Syarif Hidayat, Mas'ud Ridwan	SCM – 24
5	Hybrid Model For Supplier Selection, Procurement, And Production Catur Kurniawan, Nur Hildawati	SCM – 32
6	The Design Of Multi Role Web Based Supply Chain Simulation Game For Learning Armand Omar Moeis, Rama Raditya, Akhmad Hidayatno	SCM – 41
7	Performance Analysis Of Green Supply Chain Management In Pt Tirta Investama Subang Agus Purnomo	SCM – 48
8	Model For Supply Chain Network Design with Profit Balancing Consideration Harwati, Muhammad Ridwan Andi Purnomo	SCM – 56
9	The Influence of Supply Chain Management to Product Quality at PT XYZ in Jakarta Andi Wijaya, Richard Andrew	SCM – 62
10	Production Planning Control to Minimize Production Cost Nunung Nurhasanah, Riyana Susanti	SCM – 67
11	Measurement Supply Chain Performance Using Metric of SCOR Model (Case Study : Automotive Component Manufacturing) Nofi Erni	SCM – 75
12	Designing Green Supply Chain Management In Cocoa Agroindustry : Problem Identification And Profiling Iphov Kumala Sriwana, Yandra Arkeman, Dahrul Syah, Marimin	SCM – 81
13	Spare Parts Distribution Route Planning with Saving Matrix Method at PT.XYZ Iphov Kumala Sriwana, Sylvia Madusari, Nurulita Aulia Sari	SCM – 90

OR – Operation Research

No	Title and Author	Page
1	Crashing Project Schedule Network with Methods Selection Ismail H. Asrul	OR – 1

ER – Ergonomics

No	Title and Author	Page
1	The Analysis of The Effect on Physical Environment Factor for Noise and Luminous to Accuracy Score on Reading and Colors Matching Wahyukaton	ER – 1
2	Optimum Design of 1-DOF Anthropomorphic Thumb Considering Grasping Motion for Indonesian Low-Cost Prosthetic Hand Tyo Prasetyo, Susy Susmartini, Ilham Priadythama	ER – 7
3	The Cutting Ampoule Design Inovation to Develop Safety and Helath Patient Yuwono B Pratiknyo, Anita Purnamayanti	ER – 13

ER – Ergonomics

No	Title and Author	Page
4	Design Measurement for Manufacturing Ergonomic Value of an Automotive Part Using The Total Ergonomic Approach Model Tiena G. Amran, Nataya Charoonsri Rizani, Herawan Setio	ER – 19
5	Train Derailments In Indonesia - A Study Using Human Factors Analysis and Classification System Citra Wanurmarahayu, Hardianto Iridiastadi	ER – 29
6	Designing Workbench on The Sawmill Station to Reduce Physical Load at Surya Mas Factory Lamto Widodo, Andres, Fransisca Lipin	ER – 35

DSS – Decision Support System and Artificial Intelligence

No	Title and Author	Page
1	Database Management System Application (Case Study: Twisbless) Raymond Bahana, Hans Kristian	DSS – 1
2	A Design Of Learning Management System Using Adaptive Recommendation Method Jinsuk Yang, Kyoungsu Oh, Sangjun Lee	DSS – 9
3	Customer Relationship Management Information System Development In PT. Citra Van Titipan Kilat Fransiskus Adikara, Ricky Fauzi	DSS – 14
4	Occlusion Detection Of Virtual Target For Augmented Reality Gyeyoung Kim , Changjin Suh, Sangjun Lee, Soowon Lee	DSS – 21
5	The Emergence of User Requirement Risk In Information System Development for Industry Needs Fransiskus Adikara, Benhard Sitohang, Bayu Hendradjaya	DSS – 27
6	A Progress in Business Intelligence Implementation in CRM (Customer Relationship Management), SCM (Supply Chain Management) And Quality Management Rina Fitriana, Marimin, Taufik Djatna	DSS – 34
7	Evaluation of The VRP Completion with Developing Hybrid Genetic Algorithm Using Fuzzy Logic Controller Model Yogi Yogaswara	DSS – 44
8	Proposed Of Decision Policy Model Development For City Logistics Stakeholders Yogi Yogaswara, B. Kombaitan, Idwan Santoso	DSS – 54

PS – Production System

No	Title and Author	Page
1	Optimization of A Shock Absorber Assembly Line Using Simulation Iwan A. Soenandi	PS – 1
2	Design of Lean Production System Using Integrated Value Stream Mapping Approach Yadrifil, Irvanu Rahman, Faisal Akbar	PS – 6

PS – Production System

No	Title and Author	Page
3	Identification Performance And Machine Failure of Manufacturing System Based On OEE And FMEA Methods (Case Study On PT. APF) Jazuli, Angga Laksitama, Adelia Dini Meinarwati	PS – 12
4	Automated Multi-View Visual Inspection and Grading System For Shrimp Yudha Prasetyawan, Putu Dana Karningsih, Lucky Sabrina Adluna	PS – 18
5	Maintenance Task Design And Spare Part Inventory Policy For An Evaporation Sub System Yudha Prasetyawan, Weny Yuliana Sari	PS – 26
6	Analysis of Factors Affecting Throughput Rate in Flexible Manufacturing System with Automated Guided Vehicle System Teuku Yuri M. Zagloel, Romadhani Ardi, Lusyaneko Tantri	PS – 33
7	Insertion Heuristic for The Single Row Layout Problem in Flexible Manufacturing Systems Tjutju Tarliah Dimiyati	PS – 40
8	Optimization Of MIDI Synthesizer On The Illustration Of Movie Music Pandan Pareanom Purwacandra, Ferry Wahyu Wibowo	PS – 46
9	Implementation Theory of Constraint on CFM56-3 Aircraft Engine Maintenance Untung Mahargo B. P., Hardianto Iridiastadi, E. Nina S. Y., Zulfa F. I	PS – 52
10	The Implementation Of Lean Six Sigma Method in Production Process of Underwear Rider R333B at PT. XYZ Johnson Saragih, Rahmi Maulidya, Diana Jane Halim	PS – 60
11	The Effect Of Demand Behavior Of Automotive Glass Manufacturer On Cost of Good Sold And Logistics Performance Through System Dynamics Approach M. Nurman Helmi	PS – 66
12	The Proposed Layout Design Using Factory Systematic Layout Planning Method at PT. Jasa Laksa Utama Lina Gozali, Silvi Ariyanti, Leowendo Putrajaya	PS – 72
13	Remodelling The Maintenance Performance Management System Rivan Syamsurijal Biya, Triwulandari S. Dewayana, Nora Azmi	PS – 77
14	Analysis of Outer Tube Casting Product Reject Using Computer Aided Engineering Ahmad Juang Pratama	PS – 84
15	Solving Assembly Line Balancing Problem Using Genetic Algorithm Technique with Partitioned Chromosome Nora Azmi, Iman Yahya Azzubaidi, Sumiharni Batubara	PS – 91
16	Production Scheduling Optimisation Using Genetic Algorithm in PT. Progress Diecast Lily Amelia, Aprianto	PS – 99
17	Applying Theory of Constraint and Bottleneck Scheduling Approach to Solve Production Capacity Problem Sumiharni Batubara, Rahmi Maulidya, Mega Rahma Pertiwi	PS – 106
18	Improvement Of Kanban System Based On Theory of Constraint Rahmi Maulidya, Iveline Anne Marie, Kevin	PS – 112

IM – Industrial Management

No	Title and Author	Page
1	Customization of Open Source Enterprise Resource Planning System Muhammad Ridwan Andi Purnomo, Luthfina Ariyani	IM – 1
2	The Technology Implementation in Academic Processing to Achieve Effectiveness and Efficiency Of Information (A sharing from The Private University in Bandung) Elizabeth Tiur M.	IM – 7
3	Description and Review Existing Knowledge Management Framework, System, Technology and Architecture Riya Widayanti	IM – 13
4	Implementation of Evaluation Model and Supplier Performance Scorecard in Selecting Supplier Johan Oscar Ong, Merry Erliani	IM – 28
5	The Marketing Mix Strategy Based On Consumer Behavior Analysis at Taxi Max Cipaganti In Surabaya Esti Dwi Rinawiyanti, Rosita Meitha, Ira Mayasari	IM – 39
6	Catastrophe Model for Analyzing Behaviour of Development Policies In Indonesia Dadan Umar Daihani	IM – 47
7	Understanding Accounting Franchise, Guidance by Franchisor and Going Concern of Franchise Company in Bandung Liza Laila Nurwulan, R. Mochammad Noch, Elsaf Kurniawan	IM – 56
8	Five V's in Customer's Perspective Richard Andrew, Andi Wijaya	IM – 66
9	Services Improvement with Triz and TOPSIS Method Feliks Prasepta S.Surbakti, Lenard	IM – 74
10	Defining The Collaborative Key Performance Indicators in Performance Management Marsellinus Bachtiar	IM – 81
11	Designing Map Strategy Performance Measurement Functional Units Organization Method Based on The Balanced Scorecard (Case Study XYZ University) Ahmad Chirzun, Mohamad Sulkhan	IM – 88

THE CUTTING AMPOULE DESIGN INOVATION TO DEVELOP SAFETY AND HELATH PATIENT

Yuwono B Pratiknyo¹, Anita Pumamayanti²

¹ Lecture of Manufacturing Engineering, ² Lecture of pharmacy.

Universitas Surabaya

Jln Raya Kalirungkut, Surabaya, Telp/Fax: +62-31-2981258/+62-31-2981151

E-mail : yuwonobudi@ubaya.ac.id

ABSTRACT

The Sterilization process of pharmaceutical drugs in the world is important. That is absolutely necessary to prevent contamination of the drug to the effects from the outside. One of technique to keep the drug packaging sterilization is to use glass vials (glass ampoule). In the last decade Glass vials with click-open system widely used by the pharmaceutical industry to conduct drug packaging, especially in the form of Liquid. In terms of sterilization, glass ampoule was able to prevent the contamination of drugs against external influences, but from the use by health workers there are still some problems to the use of glass ampoules. Some of the problems include the possibility scratch paramedics hands when breaking ampoules head, the chances of transmitting diseases (hepatitis, HIV) and the possible presence of small pieces of glass ampoules are included in the drug when cutbacks are not perfect. This study will resolve the problem above design method that begins with identifying needs (Costumer Needs Identification), the development of concept (concept generation), the selection of concepts (concept selection), design analysis (ergonomics, engineering), prototype, prototype and improved prototype.

The result of this research is an innovative design with cutting ampoules press and broken system, where the design is attention to ergonomic aspects of the user's hands. The tool can also be used to adjust the size of the vial making it easier for health workers to conduct inject able drug delivery.

Key words: ampoule, opener, sterilization, design

INTRODUCTION

Background

Comprehensive health services in Law No. 44 Year 2009 on the Hospital include efforts to improve the quality of life (promotion), prevention (preventive), treatment (curative), and recovery (rehabilitative). In every health service generally involves the administration of

One of the processes of drug delivery is through injecting drug ampoules in packs. On drug delivery with packing vials, ampoules must be cut using special saws (Figure 1 (a)) or a broken finger (Figure 1 (b)) in order to take liquid medicine in it with a syringe.

Cutting process with special saws or a broken finger is potentially hazardous and infectious HIV or hepatitis due to splashes of blood from a finger scratched. (Stoker, R, 2009). The Research in the United States of America, say that the costs related to accidents caused by sharp objects in the hospital for \$ 3000 - 9000/year. The biggest cost incurred for the initial test probability of disease, further tests and measures to address them. (Stoker R, 2008). One of the diseases is susceptible to infection of health workers, both as agents of disease transmission as well as victims who contracted the disease.

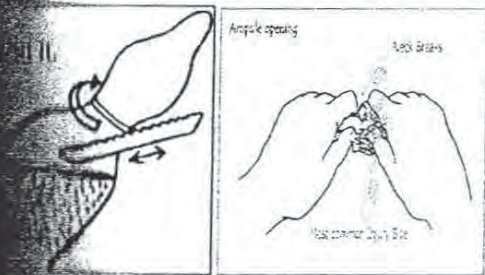


Figure 1: (a) Process of Cutting ampoule, (b) ampoule fracture.

One of the most common diseases transmitted through a syringe or biological fluids such as blood is HIV / AIDS. As we know, there "iceberg phenomenon" related to HIV / AIDS, i.e. the number of cases that have been identified much less compared to the case of HIV / AIDS has not been revealed. In contrast, patients primarily in Emergency, Intensive Care Unit and the operating room was an individual susceptible to diseases due to decreased immune system for a particular disease, and the consequent reliance on aid health workers in private health maintenance efforts such as inject able drug delivery.

Ampoule cutter products currently grown using methods and materials that can be selected by the manager of the hospital, but there are still some shortcomings in terms of both technical (how to work, the pieces, the mechanism) and in terms of non-technical (availability, price). The specific objective of this study was to obtain design cutlery ampoule that suits your needs, is effective, efficient, and economical and can guarantee the safety of health care workers and patients. Based on these results, it is expected to formulate a future improvement of service standards operating procedures and control drug delivery utilizing cutting tools ampoules, as well as improving the quality of health services in general.

1.2. Ampoule

Ampoule has advantages as injecting drug packaging, which ensures sterility of the drug from germs or contaminants, and more suitable for a liquid drug that can undergo chemical change with rubber or glycerin that is often found on the packaging vial. In addition, the liquid medicine in the vial has been formulated in the correct dosage and requires no dilution or dilution. Ampoule consists of 4 main parts of the body ampoule, ampoule neck, scored points and conical top, as shown in figure 2.

The process of cutting ampoule has grown by several methods and material cutter. Ampoule cutting methods are generally divided into two methods, namely scratching (scratch) and fracture (break).

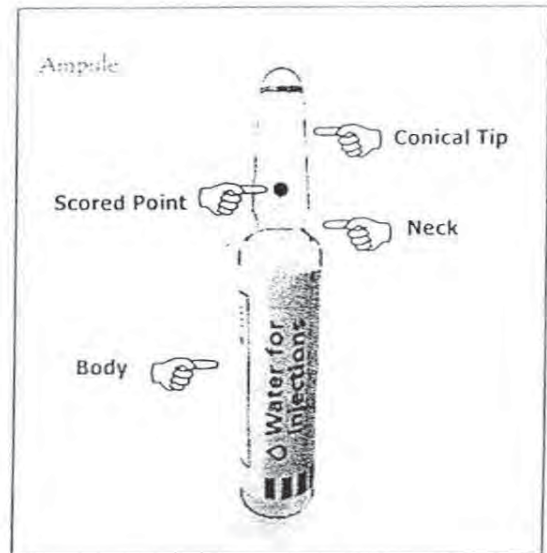


Figure 2: Part of the ampoule
Sources: <http://nursingskills-guide.blogspot.com/2010/03/ampoule.html>
Downloaded on August 30, 2012

Etching process done on glass ampoules (glass ampoule) on the neck ampoule glass ampoules for easy cut. Etching process done in general by using a special saw or a sharp knife. Etching by using a special cutter roller ampoules developed by Pro-Tech Inc., By introducing the ampoule opener multifunction products (multi functional ampoule opener) (Fig. 3).



Figure 2: Ampoule opener Pro-Tech Inc.
Sources: <http://www.protechinc.cn>
Downloaded on August 30, 2012

The working principle of these products begins by etching process part of the ampoule using a roller cutter, after scratching the glass ampoule is completed then the conical tip will be incorporated into the product (adjusts size) and do the breaking. In these products, health workers

must be careful not too deep etching process, because if the etching done too in the fine glass powder will go into ampoules and very dangerous for the patient.

In the method of breaking, breaking is done by tapping on the side of the conical tip

resulting in fracture at the neck ampoule. Some of the products developed with this system include the Break-safe ampoule opener (Figure 4 (a)), ampoule breaker (Figure 4 (b)), snap its opening glass ampoule (Figure 4 (c)), Click Open ampoule (Figure 4 (d)).

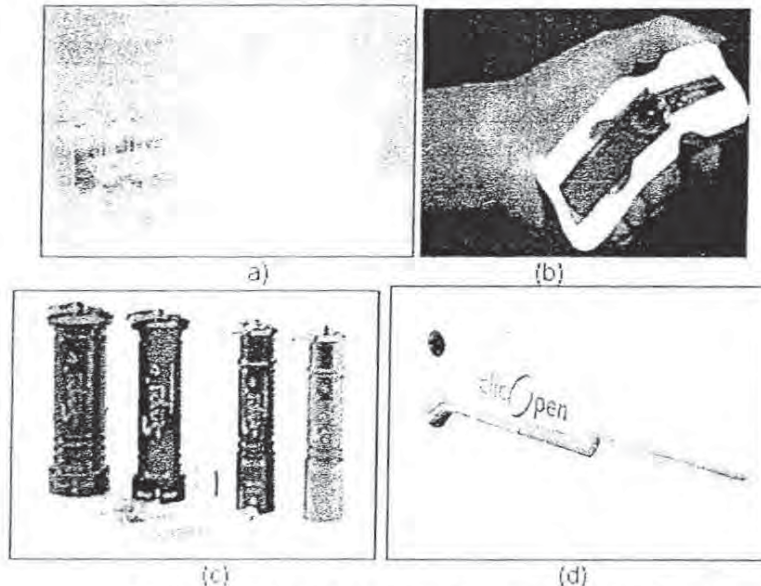


Figure 4: Example products using Fracture

Sources: <http://www.snapit.com.au/snapit/index.html>,

<http://www.emsdiasum.com/microscopy/products/preparation/general.aspx>, retrieved August 30, 2012

2. METHODOLOGY

Design methodology is necessary in designing a product in order to design a product can be arranged in a systematic way. With a design flow that has been determined, it will facilitate the process of designing a product.

Problem Identification, Problem Identification can be carried out with field survey (directly observed) and interviews with health professionals and patients

Data collection, data required include: data on the ampoule, behavior study, and the study of ergonomics use vials. These data are used as the initial product specification.

Design Concept Development.

Preparation of design concepts in the form of the initial sketch, the design of the shape, dimensions and mechanism. From

design concepts that have been made, the chosen one of the best design concept. The concept design was chosen to be developed further and made the design process more seriously.

Technical analysis, technical analysis performed on components that are considered critical.

Making Drafting, Drawing techniques required in the manufacturing process.

Manufacturing and Assembly Processes,

At this stage of the manufacturing process and the process selected in accordance with the design assembly.

Prototype Fabrication and Testing, testing was conducted to determine whether the results of the design is functioning properly or not. Moreover, to

know that there are deficiencies in the design if the product is used.

The design process begins by mapping and resume to problems that occur in the use of ampoules. Several issues related to customer needs identification in this case is the need for health workers, among others, are:

- The process of opening glass ampoules can be performed safely and easily.
- Able to be used for some measure of ampoules (1 ml, 2 ml, 5 ml and 10 ml).
- Tool that is used to recycle / recycle.
- Components of cutting tools ampoules secure against the effects of chemical drugs and vice versa, the component does not affect the existing liquid medications.

e. From the price, the hospital management wanted the price of the tool is not expensive with a price range between Rp 5.000,00 - Rp 10.000,00

From some identification on customer needs, the next step is to develop a design concept (concept generations).

2.1. Concept Generation.

In this ampoule cutter designs, there are several development concepts used to develop product specifications that will be designed. Preparation of concept to be used is made in the morphology chart as shown in table 1. As the references selected Click Open ampoule (Figure 4 (d)).

Table 1. Morphology Chart

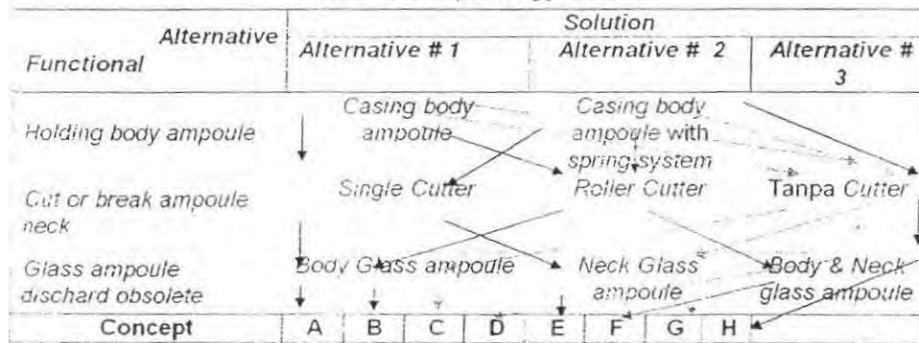


Table 2. Concept Screening

Selection criteria	Ref.	concept							
		A	B	C	D	E	F	G	H
Security for health workers	0	0	0	0	1	1	1	1	1
Ergonomic	0	-1	-1	-1	-1	-1	0	0	1
Results of ampoule neck pieces	0	1	1	1	1	1	1	1	1
Competitive price	0	-1	-1	-1	-1	-1	-1	-1	-1
Manufacturing & assembly process	0	-1	-1	-1	0	-1	0	0	0
Reliability	0	0	0	0	0	0	1	1	1
Contamination of drug equipment	0	-1	-1	-1	-1	-1	-1	0	0
TOTAL	0	-3	-3	-3	-1	-2	1	2	3
RANGKING	4	7	7	7	5	6	3	2	1
CONTINUED	N	N	N	N	N	N	Y	Y	Y

Table 3. Concept Screening

Selection Criteria	1	2	3	4	5	6	7	Total	Percentage
1	-	1	1	1	1	1	1	6	27,27
2	0	-	1	1	1	0	1	4	18,18
3	0	0	-	0	0	0	1	1	4,54
4	0	0	0	-	0	0	1	1	4,54
5	0	0	0	1	-	0	0	1	4,54
6	1	0	1	1	0	-	1	4	18,18
7	1	0	1	1	1	1	-	5	22,72
Total								22	100

From the morphology chart in Table 1, there are 8 concepts that can be developed in the design of cutting ampoules.

2.2. Concept screening.

The concepts that have been obtained in the process of concept generation, the next step is to filter concept (concept screening). Table 2 shows the filtering concept untuk cutlery ampoule.

In the screening process concept, distilled three concepts that will be followed up to do the assessment process further concept is Concept H, G and F.

2.3. Concept Scoring

In concept scoring, selection criteria previously set remain in use. This selection criterion will be ranked from the highest to the lowest. From this ranking, will be determined weight of each selection criteria. Table 3 shows the process of assigning weights to each of the selection criteria.

Selection criteria:

- 1 Security for health
- 2 Ergonomic
- 3 Results ampoule neck pieces
- 4 Competitive Price
- 5 Manufacturing and assembly process
- 6 Reliability
- 7 Contamination of drug equipment

The explanation for Table 3 above are as follows:

- a. Values 1 and 0 indicate which functions are more primary and important to be applied in the design concept. Matrix seen by rules row to column.
- b. Range is calculated by weighting the percentage scale 1-100 to produce a more accurate percentage and valid.

From the results of the above assessment, it can be seen the percentage of the weight of each concept used for further assessment of the concept. Weight that was obtained will be multiplied with the rating of the performance of a concept. The rating of the performance can be seen in table 4.

Table 4. Rate from concept Performance

Performance concerned	Rating
Very poorly compared with concept of reference	1
poorly compared with concept of reference	2
Same with concept of reference	3
Better than concept of reference	4
Very goods from concept of reference	5

After having determined the weighting and rating to rank the performance of a concept, the next step into the concept assessment phase to determine the final concept to be used. Elections for the concept that has been obtained, the three concepts can be selected by the method of scoring concept.

Table 5. Rate from concept Performance

Selection Criteria	weighting	Concept					
		F		G		H	
		Rating	Value	Rating	value	Rating	value
Security for health	27,27	4	109,4	4	109,4	4	109,4
Ergonomic	18,18	2	36,36	3	54,54	4	72,72
Results ampoule neck pieces	4,54	4	18,16	4	18,16	4	18,16
Competitive price	4,54	2	9,08	2	9,08	2	9,08
Manufacturing & assembly process	4,54	2	9,08	3	13,62	3	13,62
Reliability	18,18	3	54,54	4	72,72	4	72,72
Contamination of drug equipment	22,72	2	45,44	2	45,44	3	68,16
Total Value			282,06		322,96		363,86
Rating			3		2		1
Develop?			no		no		yes

From the assessment matrix concept, we can see that the concept of H has the highest total value. Thus, the concept of H are selected concepts and will do the manufacturing and assembly process. H concept sketches can be explained in Figure 5.

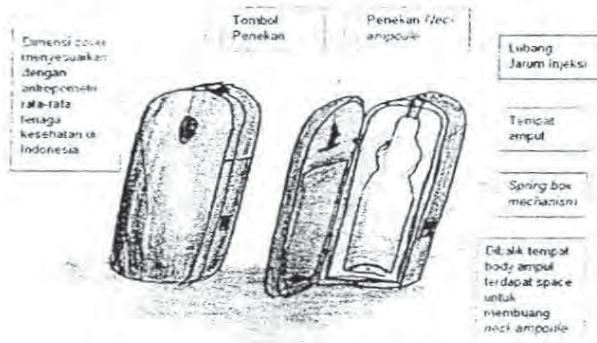


Figure 5: Selected Concept

5. CONCLUSION

Comprehensive health services in Law No. 44 year 2009 should be pursued and followed up significantly in order to improve the quality of services in Indonesia. Synergy engineering technology to the world of pharmacy and medicine need to be improved to create improved facilities and infrastructure pharmaceutical and medical world. Ampoule cutter design is expected to help much in charge of health care while maintaining the safety and security of health workers and patients. The end result of this research is the design of cutting ampoules safe and easy to use, can be cut ampoules with some variations in size, made of safe materials to the effects of chemical drugs and did not have any effect / risk for drug use. As well as in terms of the price, this product is more expensive than similar products

6. REFERENCES

- (a) Arbuckle, RB, Adamus, AT, King, KM, (2002). Pharmacoeconomics in Oncology. *Expert Rev. Pharmacoeconomics Outcomes Res.* 2(3).
- (b) Bootman JL, Townsend RJ, Ghan WF. (2005). Principles of Pharmacoeconomics. 3rd ed. USA: Harvey

Whitney Books Company. PP. 1-10, 83-113.

- (c) Kementerian Kesehatan Republik Indonesia, (2009). Undang Undang Nomor 44 Tentang Rumah Sakit.
- (d) Kementerian Kesehatan Republik Indonesia, (2004). Keputusan Menteri Kesehatan Nomor 1197/Kepmenkes/SK/X/2004 Tentang Standar Pelayanan Kefarmasian di Rumah Sakit
- (e) Stoker R, (2008). Zero Sharp Injuries – A Goal We Can Live with: Reducing Exposures in The Operation Room. *Managing Infection Control Magazine.* PP 52-46. Accessed from <http://www.isips.org/reports/Articles/december2008/zeroneedlesticks.pdf/>
- (f) Stoker R, (2009). Preventing Injuries from Glass Ampoules Shards – Advances in Glass Ampoules Breaker *Managing Infection Control Magazine* PP. 45-47. Accessed from <http://www.isips.org/reports/Articles/mic1009r45.pdf/>
- (g) World Health Organization, (2008) Revised Injection Safety Assessment Tool (Tool C-Revised). Accessed from http://www.who.int/injection_safety/Injection_safety_final-web.pdf
- (h) <http://www.emsdiasum.com/microscopy/products/preparation/general.aspx>, accessed on August 30th, 2012.

AUTHOR BIOGRAPHIES

Yuwono B Pratiknyo is a lecturer in Department of Manufacturing Engineering, Faculty of Engineering, Universitas Surabaya. He received his Master of Engineering from Institut Teknologi Bandung in 2008. Her research interests are in the area of Engineering design and Design Product. She is a member of the manufacturing Engineering, as a Head of department.



ISIEM

 <http://isiem.net>