



# IJAM

## INTERNATIONAL JOURNAL OF ADVANCED MULTIDISCIPLINARY

E-ISSN: 2829-6192, P-ISSN: 2829-6184

<https://greenpub.org/index.php/IJAM>  
editor@greenpub.org  
0811 7401 455

- p-ISSN - 2829-6184
- e-ISSN - 2829-6192
- Online Submission
- About Journal
- Editorial Team

### IJAM MENU

- Peer-Reviewers
- Peer-Review-Process
- Aim and Scope
- Publication Ethics
- Online Submission Guidelines
- Plagiarism Check
- Article Processing Charge
- Open Access Statement
- Copyright and License
- Statistics
- Template

Home > Submissions

## Submissions

or  to make a submission.

## Submission Preparation Checklist

As part of the submission process, authors are required to check off their submission's compliance with all of the following items, and submissions may be returned to authors that do not adhere to these guidelines.

- The submission has not been previously published, nor is it before another journal for consideration (or an explanation has been provided in Comments to the Editor).
- The submission file is in OpenOffice, Microsoft Word, or RTF document file format.
- Where available, URLs for the references have been provided.
- The text is single-spaced, uses a 12-point font, employs italics, rather than underlining (except with URL addresses), and all illustrations, figures, and tables are placed within the text at the appropriate points, rather than at the end.
- The text adheres to the stylistic and bibliographic requirements outlined in the Author Guidelines.

## Copyright Notice

Authors who publish their manuscripts in this journal agree to the following conditions:

- The copyright on each article belongs to the author(s).
- The author acknowledges that the International Journal of Advanced Multidisciplinary (IJAM) has the right to be the first to publish with a [Creative Commons Attribution 4.0 International license \(Attribution 4.0 International \(CC BY 4.0\)\)](#).
- Authors can submit articles separately, arrange for the non-exclusive distribution of manuscripts that have been published in this journal into other versions (e.g., sent to the author's institutional repository, publication into books, etc.), by acknowledging that the manuscript has been published for the first time in the International Journal of Advanced Multidisciplinary (IJAM).

### VISITORS



### ISSN

e-ISSN: 2829-6192



p-ISSN: 2829-6184



### Information

- For Readers
- For Authors
- For Librarians

### INDEX BY



### PUBLISHER

IJAM is published by Greenation Publisher & Yayasan Global Research National

### EDITORIAL OFFICE

#### INDONESIA

Jl. Kap. A. Hasan, Telanipura Jambi-Indonesia

#### MALAYSIA

Unipark Condominium, Block D 3-9 Selangor, Malaysia

#### SINGAPORE

Singapore #55B Jurong West ST 61#12-542 Singapore 642655

### Contact Info

+62 812-1046-7572 (Whatsapp)

<https://greenpub.org/>

<http://greenpub.org/IJAM>

[editor@greenpub.org](mailto:editor@greenpub.org)



Creation is distributed below License: Creative Commons Attribution 4.0 International

[View My Stats](#)



# IJAM

## INTERNATIONAL JOURNAL OF ADVANCED MULTIDISCIPLINARY

E-ISSN: 2629-6192, P-ISSN: 2629-6184

<https://greenpub.org/index.php/IJAM>  
editor@greenpub.org  
0811 7401 455

- p-ISSN - 2629-6184
- e-ISSN - 2629-6192
- Online Submission
- About Journal
- Editorial Team

### IJAM MENU

- Peer Reviews
- Peer Review Process
- Aim and Scope
- Publication Ethics
- Online Submission Guidelines
- Plagiarism Check
- Article Processing Charge
- Open Access Statement
- Copyright and License
- Statistics
- Template

### VISITORS



### ISSN

e-ISSN: 2629-6192



p-ISSN: 2629-6184



### Information

- [For Readers](#)
- [For Authors](#)
- [For Librarians](#)

Home > About the Journal

## About the Journal

**International Journal of Advanced Multidisciplinary (IJAM)** is an international, peer reviewed, open access, scientific and scholarly journal which publishes Research papers, Review papers, Mini reviews, Case reports, Case studies, Short communications, Letters, Editorials, Books, Thesis, Dissertation works, etc., from all the aspects of Agricultural Science, Biological Science, Business, Chemical Science, Education Science, Engineering and Technology, Humanities, Life Science, Physical Science, Marine Science, Social science. After publishing, articles are freely available through online without any restrictions or any other subscriptions to researchers and readers worldwide.

### INDEX BY



### PUBLISHER

IJAM is published by Greenation Publisher & Yayasan Global Research National

### EDITORIAL OFFICE

#### INDONESIA

Jl. Kap. A. Hasan, Telanaipura Jambi-Indonesia

#### MALAYSIA

Unipark Condominium, Block D 3-9 Selangor, Malaysia

#### SINGAPORE

Singapore 6558 Jurong West ST 61#12-542 Singapore 642655

### Contact Info

+62 812-1046-7572 (Whatsapp)

<https://greenpub.org/>

<http://greenpub.org/IJAM>

[editor@greenpub.org](mailto:editor@greenpub.org)



Creation is distributed below License: Creative Commons Attribution 4.0 International

[View My Stats](#)



# IJAM

## INTERNATIONAL JOURNAL OF ADVANCED MULTIDISCIPLINARY

E-ISSN: 2829-6192, P-ISSN: 2829-6184

<https://greenpub.org/index.php/IJAM>  
editor@greenpub.org  
0811 7401 455

- p-ISSN - 2829-6184
- e-ISSN - 2829-6192
- Online Submission
- About Journal
- Editorial Team

### IJAM MENU

- Peer Reviewers
- Peer Review Process
- Aim and Scope
- Publication Ethics
- Online Submission Guidelines
- Plagiarism Check
- Article Processing Charge
- Open Access Statement
- Copyright and License
- Statistics
- Template

### VISITORS



### ISSN

e-ISSN: 2829-6192



p-ISSN: 2829-6184



### Information

- [For Readers](#)
- [For Authors](#)
- [For Librarians](#)

Home > Editorial Team

## Editorial Team

### Chief Editor

Prof. Dr. M. Haidzi Ama, University of Esa Unggul Jakarta, Indonesia  
(Scopus Id : 57189481026) (Orcid ID) (Google Scholar)

### Managing Editor

Dr. Icham Kholik, University of Jambi, Indonesia

### Associate Managing Editor

Shinta Annelina Hazrati Haidzi, Ph.D, Bina Nusantara University, Jakarta Indonesia  
(Scopus Id : 57195480523) (Google Scholar)

### Editor

Prof. Dr. Veithizzal Rival Zainal U, Meru Buana Jakarta, Indonesia  
(Scopus Id : ) (Google Scholar)

Dr. Dira Lady Silvera, SE., M.S.Ak, Universitas Ekasakti, Padang, Indonesia  
(Scopus ID : 57862636600) (Orcid ID) (Google Scholar)

Dr. Andi Desfandi, Institut Informatika & Bisnis Darmajaya, Indonesia  
(Scopus Id : 57192420234) (Google Scholar)

Dr. Christina Catur Widayati, Universitas Meru Buana, Indonesia  
(Scopus ID: 57193456163) (Google Scholar)

Andri Yand, Batang Hari University, Jambi Indonesia  
(Google Scholar)

Syafi Mulyadi, Dinasti Singapore

Said Abdul Rahim, Dinasti Publisher, Tangerang selatan, Banten, Indonesia

### IT Support

Nofti Satriawan, Dinasti Publisher, Tangerang selatan, Banten, Indonesia

### INDEX BY



### PUBLISHER

IJAM is published by Greenation Publisher & Yayasan Global Research National

### EDITORIAL OFFICE

#### INDONESIA

Jl. Kapd. A. Hasan, Telanipura Jambi-Indonesia

#### MALAYSIA

Unpark Condominium, Block D 3-9 Selangor, Malaysia

#### SINGAPORE

Singapore 6558 Jurong West ST 61#12-542 Singapore 642655

### Contact Info

+62 812-1046-7572 (Whatsapp)

<https://greenpub.org/>

<http://greenpub.org/IJAM>

[editor@greenpub.org](mailto:editor@greenpub.org)



Creation is distributed below License Creative Commons Atribusi 4.0 Internasional.

[View My Stats](#)



**IJAM**

**INTERNATIONAL JOURNAL OF  
ADVANCED MULTIDISCIPLINARY**

E-ISSN: 2829-6192, P-ISSN: 2829-6184

<https://greenpub.org/index.php/IJAM>  
[editor@greenpub.org](mailto:editor@greenpub.org)  
 0811 7401 455

- p-ISSN : 2829-6184
- e-ISSN : 2829-6192
- Online Submission
- About Journal
- Editorial Team

**IJAM MENU**

- Peer Reviewers
- Peer Review Process
- Aim and Scope
- Publication Ethics
- Online Submission Guidelines
- Plagiarism Check
- Article Processing Charge
- Open Access Statement
- Copyright and License
- Statistics
- Templates

**VISITORS**



**ISSN**

e-ISSN: 2829-6192



p-ISSN: 2829-6184



**Information**

- [For Readers](#)
- [For Authors](#)
- [For Librarians](#)

**Peer Reviewers**

- Prof. İham Öztürk, Çag. University, Mersin, Turkey  
(Scopus Id : 24677678300) ([Google Scholar](#))
- Prof. Neil Senayn, PhD, Australia, Monash University, Australia  
(Scopus Id : 55882979490) ([Google Scholar](#))
- Prof. Tomi Kauppinen, Aalto University, Finland  
(Scopus Id : 15739693000) ([Google Scholar](#))
- Prof. Dr. Razali Hassan, Universiti Tun Hussein Onn, Malaysia  
(Scopus Id : 9940068000) ([Google Scholar](#))
- Asst. Prof. Dr. Chen Si, Institute of Political Science and Law, Hubei Academy of Social Sciences, Wuhan, Hubei province, 430077, China  
(Scopus Id : 52663254700)
- Prof. Dr. Muhammad Anshari, UBD School of Business and Economics, Universiti Brunei Darussalam, Brunei Darussalam.  
(Scopus Id : 24538991300) ([Google Scholar](#))
- Professor Dr. Yusliza Mohd-Yusoff, Universiti Malaysia Terengganu, Malaysia  
(Scopus Id : 57191439114) ([Google Scholar](#))
- Dr. Gautam Kumar Jha, Jawaharlal Nehru University (JNU), India  
(Scopus ID-) ([Google Scholar](#))
- Prof. Dr. Haryono Umar, Ak, MSc, CA, Perbanas Institute, Jakarta, Indonesia  
(Scopus Id : 57203723631) ([Google Scholar](#)) ([ORCID ID](#))
- Dr. Saifuddin Kims, Kolej Islam Muhammadiyah, Singapore
- Mitachul Huda, Ph.D., Universiti Pendidikan Sultan Idris, Malaysia  
(Scopus Id : 58712456800) ([Google Scholar](#))
- Prof. Madya Datuk Dr. Muhammad Hussain, Universiti Kebangsaan, Malaysia  
(Scopus Id : 57216431937) ([Google Scholar](#))
- Prof. Dr. Jamaludin Badusah, University Kebangsaan, Malaysia  
(Scopus Id : 58506807700)
- Prof. Dr. Andi Adriansyah, M.Eng, Universitas Indonesia, Indonesia  
(Scopus Id : 55176134000) ([Google Scholar](#))
- Dr. Jumadi Saputra, Universiti Malaysia Terengganu, Malaysia  
(Scopus Id : 57195569548) ([Google Scholar](#))
- Prof. Dr. Nigadino Surip Diposumarto, Universitas Mercu Buana, Jakarta  
(Scopus Id : 58354910900) ([Google Scholar](#))
- Prof. Dr. Sucherly, Universitas Padjadjaran, Indonesia  
(Scopus Id : 6663411) ([Google Scholar](#))
- Prof. Dr. Willy Anafah, Universitas Tri Sakti Jakarta  
(Scopus Id : 57199050219) ([Google Scholar](#))
- Dr. Hamzovinaah, Universitas Mercu Buana, Indonesia  
(Scopus Id : 6970473) ([Google Scholar](#))
- Dr. Sudirman, Universitas Batang Hari Jambi  
(Scopus Id : 00000000) ([Google Scholar](#))
- Dr. Yanki Hartjaeti, Universitas Indonesia, Indonesia  
(Scopus Id : 57192834321) ([Google Scholar](#))
- Dr. Munadjat, Institut Teknologi Bandung, Indonesia  
(Scopus Id : 5975329) ([Google Scholar](#))
- Dr. Aguscaim, Universitas Ekasakti (UNES) Padang  
(Scopus Id : 00000000) ([Google Scholar](#))
- Dr. Ade Octavia, Universitas Jambi, Indonesia  
(Scopus Id : 00000000) ([Google Scholar](#))
- Dr. Christina Catar Widayati, Universitas Mercu Buana  
(Scopus Id : 57193458163) ([Google Scholar](#))
- Dr. Christina Catar Widayati, Universitas Mercu Buana  
(Scopus Id : 57193458163) ([Google Scholar](#))
- Prof. Dr. Mukhtar, UIN Sultan Thaha Saifuddin Jambi, Indonesia  
(Scopus Id : 00000000) ([Google Scholar](#))
- Dr. Djoko Seryo Widodo, Universitas Krisnadipayana, Indonesia  
(Scopus Id : 00000000) ([Google Scholar](#))
- Dr. Deden Komar Pratiwa, Universitas Widyia Mukti, Bandung, Indonesia  
(Scopus Id : 00000000) ([Google Scholar](#))
- Dr. P. Eddy Sanusi Sitiranga, Universitas Krisnadipayana, Indonesia  
(Scopus Id : 00000000) ([Google Scholar](#))
- Dr. Winna Rozawina., Widyia Mukti University, Bandung, Indonesia  
(Scopus Id : 00000000) ([Google Scholar](#))



**IJAM**

**INTERNATIONAL JOURNAL OF  
ADVANCED MULTIDISCIPLINARY**

E-ISSN: 2829-6192, P-ISSN: 2829-6184

<https://greenpub.org/index.php/IJAM>  
editor@greenpub.org  
0811 7401 455

- p-ISSN - 2829-6184
- e-ISSN - 2829-6192
- Online Submission
- About Journal
- Editorial Team

**IJAM MENU**

- Peer Reviewers
- Peer Review Process
- Aim and Scope
- Publication Ethics
- Online Submission Guidelines
- Plagiarism Check
- Article Processing Charge
- Open Access Statement
- Copyright and License
- Statistics
- Template

**VISITORS**



77 FLAG

**ISSN**

e-ISSN: 2829-6192



p-ISSN: 2829-6184



**Information**

- For Readers
- For Authors
- For Librarians



**International Journal of Advanced Multidisciplinary (IJAM)** is an international, peer reviewed, open access, scientific and scholarly journal which publishes Research papers, Review papers, Mini reviews, Case reports, Case studies, Short communications, Letters, Editorials, Books, Theses, Dissertation works, etc., from all the aspects of Agricultural Science, Biological Science, Business, Chemical Science, Education Science, Engineering and Technology, Humanities, Life Science, Physical Science, Marine Science, Social science. After publishing, articles are freely available through online without any restrictions or any other subscriptions to researchers and readers worldwide.

**Table of Content**

Current Issue : Vol. 1 No. 4 (2023): International Journal of Advanced Multidisciplinary (January - March 2023)

**Articles**

**Age and Educational Level on Psychological Empowerment and Affective Commitment to Change**

Wulan Mangunjaya  
263-275

[FULL ARTICLE PDF](#)

**Hermeneutical Phenomenology of Corporate Financial Failure in Ungaran District, Bawen, Semarang Regency, Central Java**

Apolo Apollo  
276-288

[FULL ARTICLE PDF](#)

**Synchronization of Laws and Regulations Promulgated in the Indonesian Law Country according to the Principles of Establishing Legislation**

Siti Oph Muhatlah, Homa P. Siboka, M. S. Tumanggong, R: Djan Wotjowati  
287-295

[FULL ARTICLE PDF](#)

**Redesign Leak Test Machine For Part Cover Comp Head**

Sunlyanto Sunlyanto, Harwan Achyadi  
297-312

[FULL ARTICLE PDF](#)

**Standard Time Measurement Of Erection & Dismantling Of Tubular Scaffold Vs Modular Scaffold To Design Work Method**

Nutaya Dharensari Rizani, Erika Erika, Bambang Agung  
313-318

[FULL ARTICLE PDF](#)

**Analysis Of Implementation Of Work Safety And Health Management System In Accident Field In Jabodetabek Toll Road In PT. Jasa Marga (Persero) Tbk Using Hazard And Operability Method**

Razul Harli, Muhammad Firdaus, Nino Apiano  
319-326

[FULL ARTICLE PDF](#)

[VIEW ALL ISSUES >](#)

**INDEX BY**



**PUBLISHER**

IJAM is published by Greenation Publisher & Yayasan Global Research National

**EDITORIAL OFFICE**

**INDONESIA**

Jl. Kapk A. Hasan, Telanapura Jambi-Indonesia

**MALAYSIA**

Unpark Condominium, Block D 3-9 Selangor, Malaysia

**SINGAPORE**

Singapore #55B Jurong West ST 61#12-542 Singapura 642655

**Contact Info:**

+62 812-1046-7572 (Whatsapp)  
<https://greenpub.org/>  
<http://greenpub.org/IJAM>  
[editor@greenpub.org](mailto:editor@greenpub.org)



Creation is distributed below License: Creative Commons Attribution 4.0 International.  
[View My Stats](#)

FULL ARTIKEL PDF

Published: Feb 3, 2023

DOI: <https://doi.org/10.38035/ijam.v1i4.142>

Keywords:

Leak Test Machine, VDI 2221, Etsien

Sumiyanto Sumiyanto  
Institut Sains dan Teknologi Nasional, Jakarta

Harwan Achyadi  
Institut Sains dan Teknologi Nasional, Jakarta

Abstract

One of the aluminum casting component manufacturing companies produces Cover Comp Head parts that will be used on two-wheeled motorized vehicles. The customer provides that the parts produced must not leak at a pressure of 1 bar. The production demand from the customer is very high, so a redesign is needed in the form of a design for the leak tester in order to get an update on the leak test machine or the leak tester specifically for the main components of the leak tester, which are very directly related to the function of the leak tester. The method used in this redesign is the VDI 2221 method. Based on the results of the redesign carried out, it was found that the redesign concept of the comp head and tube hole compactors is more efficient in terms of dimensions and cost. So that it can provide direct benefits to the company.

How to Cite

Sumiyanto, S., & Achyadi, H. (2023). Redesign Leak Test Machine For Part Cover Comp Head. *International Journal of Advanced Multidisciplinary*, 1(4), 297-312. <https://doi.org/10.38035/ijam.v1i4.142>

WORD DOCUMENT FORMATTED

Issue

Vol. 1 No. 4 (2023) International Journal of Advanced Multidisciplinary (January - March 2023)

Section

Articles



This work is licensed under a Creative Commons Attribution 4.0 International License.

Authors who publish their manuscripts in this journal agree to the following conditions:

1. The copyright on each article belongs to the author(s).
2. The author acknowledges that the International Journal of Advanced Multidisciplinary (IJAM) has the right to be the first to publish with a Creative Commons Attribution 4.0 International license (Attribution 4.0 International (CC BY 4.0)).
3. Authors can submit articles separately, arrange for the non-exclusive distribution of manuscripts that have been published in this journal into other versions (e.g., sent to the author's institutional repository, publication into books, etc.), by acknowledging that the manuscript has been published for the first time in the International Journal of Advanced Multidisciplinary (IJAM).

References

G. Pahl, W. Beitz, J. Feldhusen and K.H. Grote. "Engineering Design: A Systematic Approach, Third Edition". London: Springer Verlag, 2007

Sularto, dan Kiyokatsu Suga. "Dasar Perencanaan Dan Pemilihan Elemen Mesin". Jakarta: Pradnya Paramita, 2013.

Croser, P, dan Ebel, F. "Pneumatics Basic Level. Festschrift". Denkkendorf: GmbH & Co, 2002.

Khurmi RS Gupta, JK. "Text Book of Machine Design". New Delhi: Eurasia Publishing House, Ltd Ram Nagar, 2005.

Sato, G. Takeshi, dan Harbanto, Sugianto. "Menggambar mesin menurut standar ISO". Jakarta: PT. Pradnya Paramita, 2010.

Prof. Dr. Ir. Dahmir Dahlan M.Sc. "Elemen Mesin". Jakarta: Citra Harta Prima, 2012.

Sigit, Puradai, Dedy, Joko, dan Iamu. "PENGEMBANGAN TEKNIK UJI KEBOCORAN DENGAN DETEKTOR GAS HELIUM". Februari 2003. Diambil dari: [http://www.iiasa.org/ins/collection/NCLCollectionShare\\_Public/44/01/44011601.pdf](http://www.iiasa.org/ins/collection/NCLCollectionShare_Public/44/01/44011601.pdf)

<http://www.leaktesting.co.uk/>

<http://mammyyone002.blogspot.co.id/2013/06/perencanaan-pneumatic.html>

<http://www.como-k.co.jp/english/leak-test/leak-technology/>

INDEX BY



PUBLISHER

IJAM is published by Greenation Publisher & Yayasan Global Research National

EDITORIAL OFFICE

INDONESIA

Jl. Kapd. A. Hasan, Telanipura Jambi-Indonesia

MALAYSIA

Unpark Condominium, Block D 3-9 Selangor, Malaysia

SINGAPORE

Singapore #55B Jorong West ST 61#12-542 Singapore 642655

Contact Info

+62 812-1046-7572 (Whatsapp)

<https://greenpub.org/>

<http://greenpub.org/IJAM>

[editor@greenpub.org](mailto:editor@greenpub.org)



Creation is distributed below License: Creative Commons Attribution 4.0 International.

[View My Stats](#)

e-ISSN: 2829-6192, p-ISSN: 2829-6184

DOI: <https://doi.org/10.38035/ijam.v1i4>

Received: 6 January 2023, Revised: 31 January 2023, Publish: 3 February 2023

<https://creativecommons.org/licenses/by/4.0/>



## Redesign Leak Test Machine For Part Cover Comp Head

Sumiyanto<sup>1</sup>, Harwan Achyadi<sup>2</sup>

<sup>1</sup>Institut Sains dan Teknologi Nasional, Jakarta, Indonesia, [sumiyanto@istn.ac.id](mailto:sumiyanto@istn.ac.id)

<sup>2</sup>Institut Sains dan Teknologi Nasional, Jakarta, Indonesia

Corresponding Author: [sumiyanto@istn.ac.id](mailto:sumiyanto@istn.ac.id)

**Abstract:** One of the aluminum casting component manufacturing companies produces Cover Comp Head parts that will be used on two-wheeled motorized vehicles. The customer provides that the parts produced must not leak at a pressure of 1 bar. The production demand from the customer is very high, so a redesign is needed in the form of a design for the leak tester in order to get an update on the leak test machine or the leak tester specifically for the main components of the leak tester, which are very directly related to the function of the leak tester. The method used in this redesign is the VDI 2221 method. Based on the results of the redesign carried out, it was found that the redesign concept of the comp head and tube hole compactors is more efficient in terms of dimensions and cost. So that it can provide direct benefits to the company.

**Keyword:** Leak Test Machine, VDI 2221, Efisien.

### INTRODUCTION

Part cover comp head is one of the automotive components for two-wheeled vehicles. Function Head Cover Comp is the automotive component that serves as a cover comp head in order to prevent the oil (fluid) does not come out or spills out when the machine is used. Therefore, comp head cover is not allowed to leak, because it would interfere with the performance of the machine caused by wear part components. Because, the oil serves as a lubricant components on the machine. Another function is as a protective component that is in it, to avoid collisions.

In the actual conditions in the production area, the demand for the production of parts Cover Comp Head is very high, resulting in the production area there are four (4) leak test machine, by which time the use of Leak Test Machine in the area of production is very high, resulting in major components on Leak Test Machine frequent replacement. So, redesign especially those on the main components in the engine leak testing is needed, in order to obtain the concept of redesign the main components in a more efficient and cost dimensions. The concept of redesign obtained, is expected to provide significant benefits for the company.

## LITERATURE REVIEW

### Leak Test

Leak test is one of a Non-destructive testing which is related to the release of substances that flow from a place of high pressure to lower pressure chamber. Leakage is considered as a defect in a product, so that the leakage has a huge impact on safety and also on the performance of the product.

### Leak Test Machine

Leak Test Machine is a tool that serves to check leakages space on a product. One is to check on automotive components that have a function as a place where the flow of a fluid or a pressurized fluid.

Leak test machine consists of several parts that support each other so that formation of a system that can process, and operates in accordance with the purpose of leak test machine, for detecting leaks in a product space.

The main components in the leak test machine is:

1. Compressing Hole Cover Comp Head

Compressing holes Cover Comp Head serves as a hole for the air compressor and the pressure does not come out of the head through the hole Cover Comp Head current leakage detection process takes place.

2. Compressing pipe hole

Compressing pipe hole serves as a pipe hole to allow air compressors and pressure does not come out of the head through a hole in the pipe comp head time leak detection process takes place.

3. Clamping

Clamping useful for comp head does not move during the process of leak detection. Clamping the leak test machine is designed to press the upper part.

4. Leak Detector

Leak Detector is a detector that serves to check for leaks in Cover CompHead.

### Design Method VDI 2221

The design is the initial activity of the business to realize a product that needs very necessary or required and have a purpose tertentu. Pahl and Beitz in his book; Engineering Design: A Systematic Approach To The Design Of Technical System and Product propose a way or method of designing a product, which is known by the method VDI 2221 (VDI = VereinDeutscherIngeniure / Association of German Engineers).

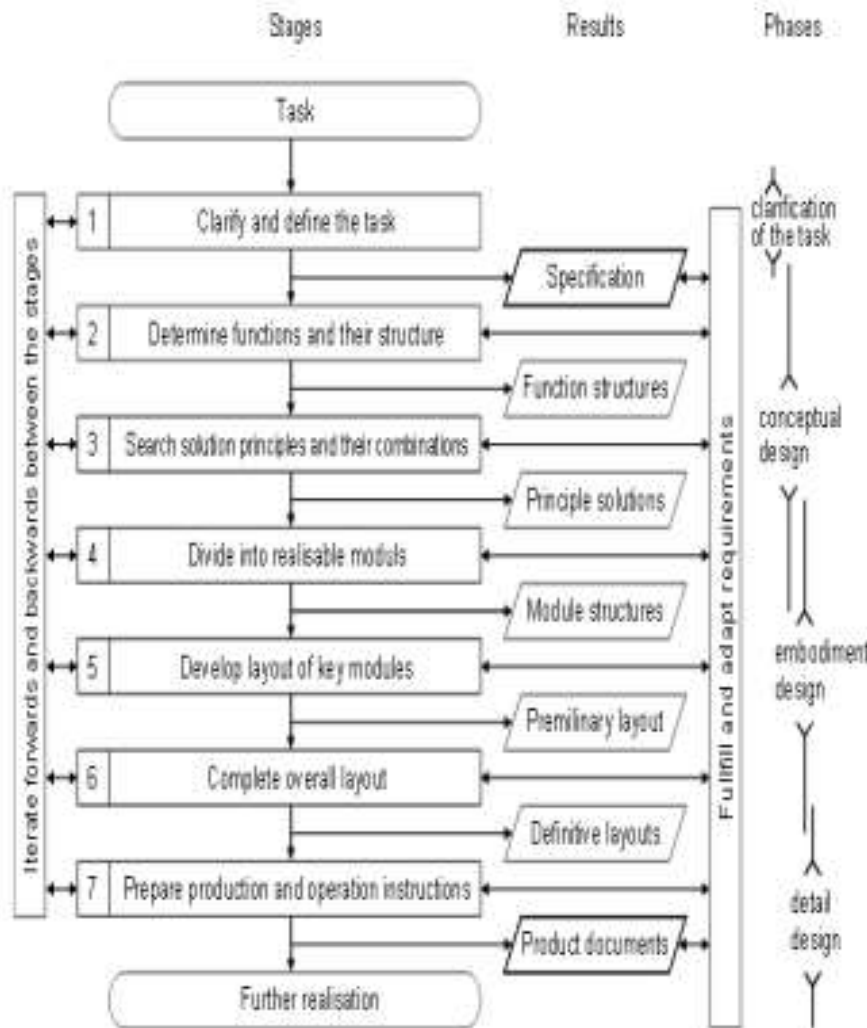
A feature of the design method using the VDI 2221 method lies in the conceptual design phase, namely the presence of steps to create a structure that functions to identify elements of the system compiler techniques to be designed.

The aim is to facilitate the designer to formulate and direct the various variants of the existing design as in the method of existing ideas efficiently and systematically arranged.

VDI 2221 method consists of four phases. The fourth phase is:

1. Clarification of the Task
2. Conceptual Design
3. Embodiment Design
4. Detail Design





**Figure 1.** Structured Procedure in the product development guideline VDI 2221

The first phase is the phase where does the formulation and list of requirements that are tailored to the will of consumers and designers, which is expected to be fulfilled by the end solution. Terms - conditions to be met in the design is distinguished as a demand or as desired.

**Conceptual Design**

Once the specification is obtained, steps are separation of data and formulation. The purpose of the separation of data and the formulation is to determine how the specifications are an important part and are generally accepted.

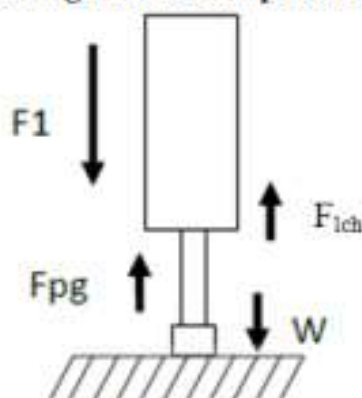
**1. Embodiment Design**

Designing a form begins with the concept of engineering products, then using technical and economic criteria, the design was developed by outlining the structure of the function into the module structure to obtain elements of structure builder function that allows the start of the design can be more detailed.

**2. Detail Design**

The fourth phase is a phase of the design process in the form of an image that has been formed products. The products are designed to be portrayed detail, so that the product manufacturing process can be easily understood or comprehended by the product manufacturer.

**Forces on the cylinder compressing hole of Comp Head and Clamping**



**Figure 2. The Force On Cylinder 1**

Force on cylinder 1 can be calculated by :

$$\sum F_x = 0$$

$$\sum F_y = 0$$

$$F1 - F_{ich} + W - F_{pg} = 0$$

$$F1 = F_{ich} + F_{pg} - W$$

Where;

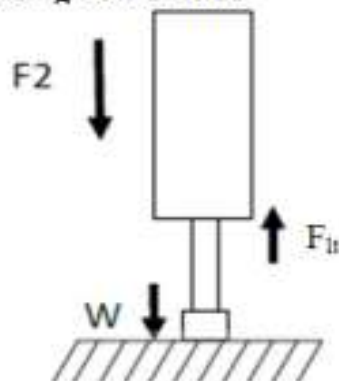
F1 = Force on cylinder 1

F<sub>ich</sub> = Air Force from hole of Comp Head

W = Force caused by heavy tool

F<sub>pg</sub> = Spring Force on clamping

**Forces on the cylinder compressing hole of tube**



**Figure 3 The Force On Cylinder 2**

Force on cylinder 2 can be calculated by:

$$\sum F_x = 0$$

$$\sum F_y = 0$$

$$F1 - F_{th} + W = 0$$

$$F2 = F_{th} - W$$

Where;

F2 = Force on cylinder2

F<sub>th</sub> = Air Force from hole of tube

W = Force caused by heavy tool

### Silinder Pneumatik

Pneumatic cylinder or actuator is a mechanical device that uses the power of compressed air (compressed air) to produce a force in a movement back - back piston in a linear manner (movement out - sign). Pneumatic cylinder is a tool or device that is often encountered in engineering - industrial machinery, be it in the automotive industry, packaging industry, electronics, and a wide range of industries and institutions - other agencies. Pneumatic cylinders used to clamp objects, push mower, a pressure pressing machine, vibration dampers, door sorting, and so forth. Pneumatic cylinders may indeed have a lot of utility functions, but the basic function of the cylinder had not been changed, where they function to convert the potential energy of air pressure or air into motion or kinetic energy.

To calculate how large diameter pneumatic cylinders are used, by the way:

$$A = \frac{F+R}{p}$$

Where:

F = Force

R = Friction = ± 3% . F

p = Working Pressure for Pneumatic

Pneumatic Pressure average is = 7 bar = 0,7 N/mm<sup>2</sup>

### METHODS

#### Spesification Leak Test Machine Existing Condition

NO	MAIN COMPONENT	SUB COMPONENT	DIMENTION
1	Compressing Hole Cover Comp Head	Uretan Head Head Plug	p = 37 mm, Ø = 22 mm p = 72 mm, Ø = 22 mm
2	Compressing Pipe Hole	Uretan Adaptor Adaptor	p = 18 mm, Ø = 17 mm p= 62,5mm Ø = 25 mm
3	Clamping	Head Bolt Spring Bolt Press	p = 15 mm, Ø = 25 mm p = 40 mm, Ø = 19 mm p= 100mm, Ø = 12 mm
4	Leak Detektor		

### Spesification

D/W	REQUIREMENTS	INFORMATION
D	<b>GEOMETRY</b> Diameter of Tool PaLeT 600mmx700mmx150mm	Adjusting the space provided
W	<b>ERGONOMI</b> a) Not cause operator fatigue	Produktivitas
W	b) Machine looks nice	Eстетika
D	c) Easy use	Produktivitas
W	d) Easy to be move	Reliabilitas
D	<b>MATERIAL</b> a) Strong and durable material	Lip Time
W	b) Easily obtainable materials	Lead time
D	c) Efficient use of materials	Cost
D	<b>FORCE ANDMOMENT</b> Force and Moment use efficient	
D	<b>PREVENTIVE</b> Easy to be preventive	Fast preventive
D	<b>QUALITY CONTROL</b> a) Can detect leak on pressure 1 bar	
D	b) Not cause part damage/reject	
D	c) Not add leak on part	

**Abstraction I**

D/W	REQUIREMENTS	INFORMATION
D	<b>GEOMETRY</b> Dimension of Tool PaLaT : 600mmx700mmx1500mm	Adjusting the space provided
D	<b>ERGONOMI</b> Easy use	Produktivitas
D	<b>MATERIAL</b> Strong and durable material	Lifes Time
D	Efficient use of materials	Cost
D	<b>FORCE ANDMOMENT</b> Force and Moment use efficient	
D	<b>PREVENTIVE</b> Easy to be preventive	Fast preventive
D	<b>QUALITY CONTROL</b> d) Can detect leak on pressure 1 bar	
D	e) Not cause part damage/object	
D	f) Not add leak on part	

**Abstraction II**

Transforming the quantitative data into qualitative which concluded the desired device is as follows:

- 1) The size does not exceed 1500mm 600mmx 700mmx
- 2) Tool easy to use by Operator
- 3) The material used is strong and durable
- 4) The material used is designed as efficiently as possible
- 5) Components Maintenance is easy and fast
- 6) Tool can detect leaks with a pressure of 1 bar

**Abstraction III**

The results of leak testing machine abstraction tool that will be created to detect leaks with a pressure of 1 bar, with material components used must be strong and durable as well as its use as efficiently as possible. The tool has a size not exceeding 600 mm x 700 mm x 1500 mm, and can be used easily by the operator.

**Function Structure**

- Overall Function



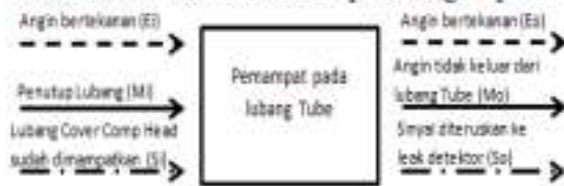
- Function in terms of *Clamping Unit*



- Function in terms of *Compressing Hole Cover Comp Head*



- **Function in terms of Compressing Pipe Hole**



- **Function in terms of leak detector**



### Principle Solution Sub Function

1. Clamping

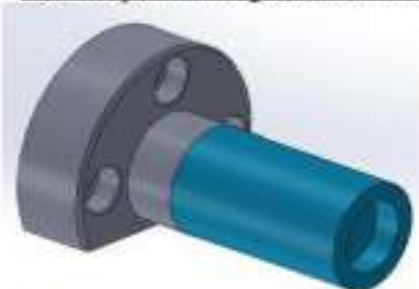


Option 1 – Silinder Universal Clamp

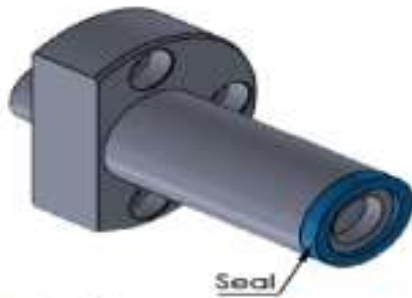


Option 2 – Silinder Individual Clamp

2. Pemampat Lubang Cover Comp Head

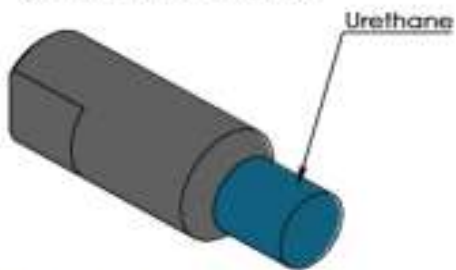


Option 1



Option 2

3. Pemampat lubang pipa



Option 1



Option 2

4. Leak Detektor



Option 1-Diferensial Pressure Machine



Option 2 – Water Dunk









### Variations Selection Leak Test Machine

TEKNIK MESIN ISTH		VARIATION TABLE OF ELECTION VARIANTS FOR LEAK TEST MACHINE						
PRINCIPAL SOLUTIONS: VARIANTS	Kriteria Pemilihan	Matriks of Variants Solution						
	+ = Yes	+ = Solution sought						
	- = No	- = Clear the Solutions						
	? = Less Information	? = Collect Information						
	! = Check specification	! = Look Specification						
	Match with overall function							
	Match with specification							
	De range of cost production							
	Knowledge Of Concept is good							
	Match with Designer Wish							
Answer a safety requirement								
	A	B	C	D	E	F	DESCRIPTION	DECISION
CL1	+	+	+	+	+	+		+
CL2	-	+	+	+	+	+		-
PCDH1	+	+	+	+	+	+		+
PCDH2	+	+	+	+	+	+		+
PLT2	+	+	+	+	+	+		+
PLT2	+	+	+	+	+	+		+
LD1	+	+	+	+	+	+		+
LD2	+	+	+	+	-	+		-
INFORMATION								
C1 = CLAMPING								
PCDH = COMPRESSING OF COMP HEAD HOLE								
PLT = COMPRESSING OF PIPE HOLE								
LD = LEAK DETECTOR								

### Variant 1 Principle Solution

NO	KOMPONEN	OPS 1	OPS 2
1	CLAMPING		
2	REINSTATE LUBING COMP HEAD		
3	REINSTATE LUBING TUBE		
4	LEAK DETECTOR		

**Variant 1 Principle Solution**

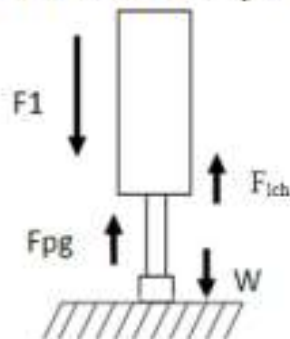
NO	KOMPONEN	OPS 1	OPS 2
1	CLAMPING		
2	REPAIRING LUBING COMP HEAD		
3	REPAIRING LUBING TUBE		
4	LEAK DETECTOR		

**Evaluation Variants of the Concept**

No	Description	Wt	Parameter	Variant 1		Variant 2			
				V1	Wv1	V2	Wv2		
1	Easy for use	0,2	Cycle Time	7	1,4	7	1,4		
2	Easy for preventive	0,2	Easy for change tool	7	1,4	8	1,6		
3	Cheap	0,15	Cost	7	1,05	8	1,2		
4	Quality of product	0,2	Not makes part reject	8	1,6	8	1,6		
5	Decision Making	0,2	Easy for look a result	8	1,6	8	1,6		
6	Visual of tool	0,05	Tool looks nice	7	0,35	7	0,35		
TOTAL				1		48	7,4	48	7,75
RANK						1		1	
DECISION						NO		OK	

**Calculation Of Force**

**1. Forces on the cylinder compressing hole of Comp Head and Clamping**



The Force On cylinder 1

Force on cylinder 1 can be calculate by :

$$\sum Fx = 0$$



$$\sum F_y = 0$$

$$F_1 - F_{lch1} - F_{lch2} + W - F_{pg1} - F_{pg2} = 0$$

$$F_1 = F_{lch1} + F_{lch2} + F_{pg1} + F_{pg2} - W$$

Dimana;

- F<sub>1</sub> = Force on cylinder 1
- F<sub>lch1</sub> = Air Force from hole of Comp Head 1
- F<sub>lch2</sub> = Air Force from hole of Comp Head2
- W = Force caused by heavy tool
- F<sub>pg1</sub> = Spring Force on clamping1
- F<sub>pg2</sub> = Spring Force on clamping2

1) Air Force from hole of Comp Head 1(F<sub>lch1</sub>)

$$F_{lch1} = F_{air} \times A$$

$$F_{air} = \text{Pressure in Comp Head}$$

$$= 0,1 \text{ (N/mm}^2\text{)}$$

$$A = \text{Large area of hole Comp Head}$$

$$= \pi r^2$$

$$= \pi \times 14^2$$

$$= 615,752 \text{ mm}^2$$

$$F_{lch1} = F_{air} \times A$$

$$= 0,1 \times 615,752$$

$$= 61,575 \text{ N}$$

2) Air Force from hole of Comp Head(F<sub>lch2</sub>)

$$F_{lch} = F_{air} \times A$$

$$F_{air} = \text{Pressure in Comp Head}$$

$$= 0,1 \text{ (N/mm}^2\text{)}$$

$$A = \text{Large area of hole Comp Head}$$

$$= \pi r^2$$

$$= \pi \times 14^2$$

$$= 615,752 \text{ mm}^2$$

$$F_{lch2} = F_{air} \times A$$

$$= 0,1 \times 615,752$$

$$= 61,575 \text{ N}$$

3) Force caused by heavy tool(W)

Heavy tools or heavy equipment obtained from direct calculation of the tool or equipment. Calculations obtained is 4 kg, so

$$W = m \times g$$

$$m = \text{mass of tool}$$

$$= 4 \text{ (kg)}$$

$$g = \text{gravitation}$$

$$= 9,81 \text{ (m/s}^2\text{)}$$

Jadi,

$$W = m \times g$$

$$= 4 \text{ (kg)} \times 9,81 \text{ (m/s}^2\text{)}$$

$$= 39,24 \text{ N}$$

4) Spring Force 1(F<sub>pg1</sub>)

$$F_{pg} = k \cdot x$$

$$\text{Spring long first (Hf)} = 40 \text{ mm}$$

Spring long attached (Hs) = 38 mm  
 Core diameter spring (D) = 15,75mm  
 Diameter spring (d) = 3,25 mm  
 The Numbers of windings (N) = 8  
 Shear Modulus (G) = 80.000 (N/mm<sup>2</sup>)

So,  
 $n = N - 1,5$   
 $= 8 - 1,5$   
 $= 6,5$

$$\begin{aligned} \text{Spring Constants (k)} &= \frac{G \cdot d^4}{8 \cdot n \cdot D^3} \\ &= \frac{80000 \cdot (3,25)^4}{8 \cdot 6,5 \cdot (15,75)^3} \\ &= 43,932 \text{N/mm} \end{aligned}$$

$$\begin{aligned} \text{Spring Force 1 (Fpg1)} &= k \cdot (H_f - H_s) \\ &= 43,932 \cdot (40 - 38) \\ &= 87,864 \text{ N} \end{aligned}$$

$$\begin{aligned} \text{Spring Force 2 (Fpg2)} &= k \cdot (H_f - H_s) \\ &= 43,932 \cdot (40 - 38) \\ &= 87,864 \text{ N} \end{aligned}$$

So, The force on cylinder 1 is  $A = F1$

$$\begin{aligned} F1 &= F_{kch1} + F_{kch2} + F_{pg1} + F_{pg2} - W \\ &= 61,575 \text{ N} + 61,575 \text{ N} + 87,864 \text{ N} + 87,864 \text{ N} - 39,24 \text{ N} \\ &= 259,638 \text{ N} \end{aligned}$$

$$\begin{aligned} R &= 3 \% \times 259,638 \text{ N} \\ &= 7,789 \text{ N} \end{aligned}$$

So, the cylinder size required is

$$A = \frac{F+R}{P}$$

$$\frac{\pi d^2}{4} = \frac{F+R}{P}$$

$$0,785 d^2 = \frac{F+R}{P}$$

$$0,785 d^2 = \frac{259,638+7,789}{0,7}$$

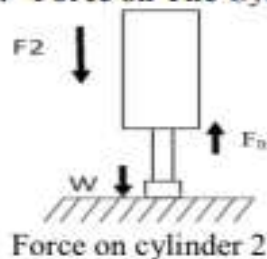
$$d^2 = \frac{267,427}{0,785}$$

$$d = \sqrt{340,671}$$

$$d = 18,457 \text{ mm} \approx 20 \text{ mm (base on the size of the market)}$$

So, based on the calculation of the cylinder diameter is required is a minimum diameter of 20 mm.

## 2. Force on The Cylinder Compressing pipe hole



Force on cylinder 2 can be calculate by:

$$\sum F_x = 0$$

$$\sum F_y = 0$$

$$F_2 - F_{fh} + W = 0$$

$$F_2 = F_{fh} - W$$

Dimana;

F<sub>2</sub> = Force on cylinder 2

F<sub>fh</sub> = Air Force from pipe hole

W = Force cause by heavy tool

1) Air force from pipe hole (F<sub>fh</sub>)

$$F_{fh} = F_{air} \times A$$

F<sub>air</sub> = Pressure in Comp Head

$$= 0,1 \text{ (N/mm}^2\text{)}$$

A = Large area of pipe hole

$$= \pi r^2$$

$$= \pi \times 7^2$$

$$= 153,938 \text{ mm}^2$$

$$F_{fh} = F_{air} \times A$$

$$= 0,1 \times 153,938$$

$$= 15,394 \text{ N}$$

2) Force cause by heavy tool (W)

Heavy tools or heavy equipment obtained from direct calculation of the tool or equipment. Calculations obtained is 0,5 kg, so

$$W = m \times g$$

m = mass of tool

$$= 0,5 \text{ (kg)}$$

g = gravitation

$$= 9,81 \text{ (m/s}^2\text{)}$$

So,

$$W = m \times g$$

$$= 0,5 \text{ (kg)} \times 9,81 \text{ (m/s}^2\text{)}$$

$$= 4,905 \text{ N}$$

So, the force ono cylinder 2 is A = F<sub>2</sub>

$$F_2 = F_{fh} - W$$

$$= 15,394 \text{ N} - 4,905 \text{ N}$$

$$= 10,489 \text{ N}$$

$$R = 3\% \times 10,489 \text{ N}$$

$$= 0,315$$

So, the cylinder size required is

$$A = \frac{F+R}{P}$$

$$\frac{\pi d^2}{4} = \frac{F+R}{P}$$

$$0,785 d^2 = \frac{F+R}{P}$$

$$0,785 d^2 = \frac{10,489+0,315}{0,7}$$

$$d^2 = \frac{15,434}{0,785}$$

$$d = \sqrt{19,661}$$

$$d = 4,434 \text{ mm} \approx 10 \text{ mm (base on the size of the market)}$$

So, based on the calculation of the cylinder diameter is required is a minimum diameter of 10 mm

**RESULT AND DISCUSSION**  
**Concept of Existing Conditon**

KONDISI AWAL			
NO	KOMPONEN	GAMBAR	KETERANGAN
1.	CLAMPING		PNEUMATIC SYSTEM
2.	PEMAMPAT LUBANG COMP HEAD		SEBAGIAN BESAR MATERIAL YANG DIGUNAKAN ADALAH URETAN
3.	PEMAMPAT LUBANG TUBE		SEBAGIAN BESAR MATERIAL YANG DIGUNAKAN ADALAH URETAN
4.	LEAK DETEKTOR		DIFFERENSIAL PRESSURE

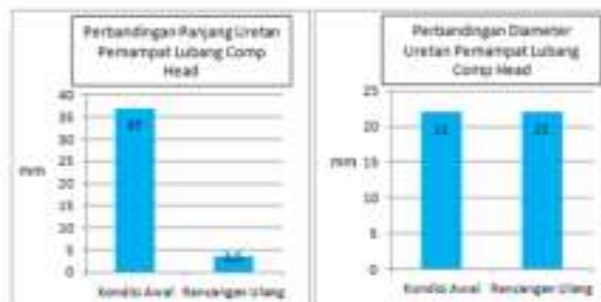
**Redesign Concept**

KONSEP RANCANGAN ULANG			
NO	KOMPONEN	GAMBAR	KETERANGAN
1.	CLAMPING		PNEUMATIC SYSTEM
2.	PEMAMPAT LUBANG COMP HEAD		MATERIAL URETAN HANYA DIGUNAKAN SEBAGIAN KECIL PADA KOMPONEN
3.	PEMAMPAT LUBANG TUBE		MATERIAL URETAN HANYA DIGUNAKAN SEBAGIAN KECIL PADA KOMPONEN. TERDAPAT PENAHAN TUBE ADAR TIDAK BENDOK.
4.	LEAK DETEKTOR		DIFFERENSIAL PRESSURE

### Comparative Analys Of the Concept

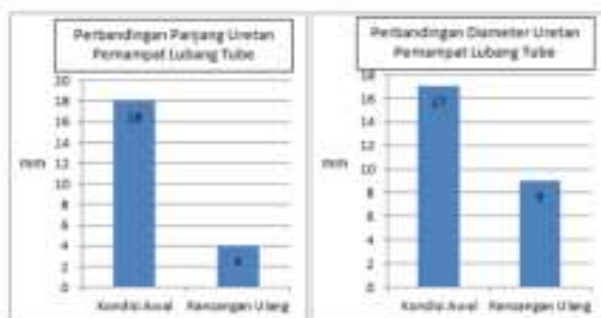
- Compressing Hole Comp Head**

Urethan Pemampat Lubang Comp Head	Kondisi Awal	Rancangan Ulang
	$p = 37mm, \phi = 22mm$	$p = 3,5mm, \phi = 22mm$

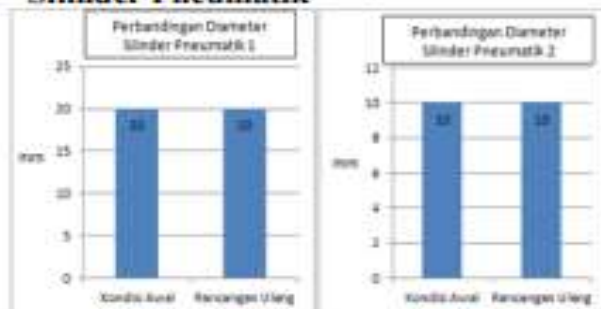


- Compressing Pipe Hole**

Urethan Pemampat Lubang Tube	Kondisi Awal	Rancangan Ulang
	$p = 18mm, \phi = 17mm$	$p = 4mm, \phi = 9mm$



- Silinder Pneumatik**



### CONCLUSION

1. With repeated Compressing holes designed Comp Head on leakage testing machine was found to affect the reliability of leak testing machines. In addition, the concept of the redesign can make efficient use of on-Compressing holes Urethane Comp Head. Urethane long experience an efficiency of 90.5%.
2. With repeated designed Compressing Tube hole in the engine leak testers found to affect the reduction in reject parts caused by the bendingatau bent tube. In addition to the redesign of the concept can make efficient use of on-Compressing holes Urethane Tube. Urethane long experience an efficiency of 77.7%, while Diameter Urethane experienced an efficiency of 47%.

3. There is no difference between the size of the diameter of Pneumatic Cylinder Pneumatic Cylinder Diameter 1 and 2 in the initial conditions to the size Diameter Pneumatic Cylinder Pneumatic Cylinder Diameter 1 and 2 on the redesign.

## REFERENCES

- G. Pahl, W. Beitz, J. Feldhusen and K.H. Grote. "Engineering Design: A Systematic Approach, Third Edition". London: Springer Verlag, 2007
- Sularso, dan Kiyokatsu Suga. "Dasar Perencanaan Dan Pemilihan Elemen Mesin". Jakarta: Pradnya Paramita, 2013.
- Croser, P, dan Ebel, F. "Pneumatics Basic Level. Festo Didactic". Denkendorf: GmbH & Co, 2002.
- Khurmi RS Gupta, JK. "Text Book of Machine Design".New Delhi: Eurasia Publising House, ltd Ram Nagar, 2005.
- Sato, G. Takeshi, dan Hartanto, Sugiarto. "Menggambar mesin menurut standar ISO". Jakarta: PT. Pradnya Paramita, 2010.
- Prof. Dr. Ir. Dahmir Dahlan M.Sc. "Elemen Mesin". Jakarta: Citra Harta Prima, 2012.
- Sigit, Puradwi, Deddy, Joko, dan Ismu. "Pengembangan Teknik Uji Kebocoran dengan Detektor Gas Helium". Februari 2003. Diambil dari: [http://www.iaea.org/inis/collection/NCLCollectionStore/\\_Public/44/011/44011601.pdf](http://www.iaea.org/inis/collection/NCLCollectionStore/_Public/44/011/44011601.pdf)
- <http://www.leaktesting.co.uk/>
- <http://imammulyono002.blogspot.co.id/2013/06/perencanaan-pneumatic.html>
- <http://www.cosmo-k.co.jp/english/leak-test/leak-technology/>