UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Stamping Oil Conditioning Monitoring at Miyazu Using FT-iR: Water Peak Monitoring for Blanking Line

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Degree of Manufacturing Engineering in (Manufacturing Process) with Honours.

by

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I hereby declare that this report entitled "Stamping Oil Conditioning Monitoring at Miyazu Using FT-iR: Water Peak Monitoring for Blanking Line" is the result of my own research except as cited in the references.

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APPROVAL

This report is submitted to the Faculty of Manufacturing Engineering of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Manufacturing Engineering (*Manufacturing Process*). The members of the supervisory committee are as follow:

Mr Mohd Fairuz Dimin
(Main Supervisor)

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ABSTRACT

This study is about monitoring the condition of stamping oil at Miyazu (M) Sdn. Bhd. where lubrication oil for stamping process at blanking line in miyazu are being monitored for it soot contamination against the part produced. The main purposed of this study is to analyze and monitor the quality content of the lubricant oil. Objective defined states that this study is to define whether soot contamination inside the lubricant oil is the contributing factor for the dent problem on part quality produced. Prior to this purposed, sample oil is taken in a specified time and FT-iR machine with ASTM E2412-04 is used in order to observe the content of the lubricant oil. Result from the FT-iR machine will analyze the features or what consists in the lubricant oil.

ABSTRAK

Tujuan utama kajian ini dilakukan adalah untuk menganalisis dan mengawal kandungan minyak pelincir yang digunakan semasa proses pembentukan produk. Kajian ini untuk mengenal pasti adakah minyak pelincir yang digunakan penyebab utama kepada berlakunya lekuk atau kemik pada bahagian produk dihasilkan. Daripada analisis dengan menggunakan FT-iR berdasarkan ASTM E2412-04 kita akan dapat mengetahui kandungan bendasing di dalam minyak pelincir yang digunakan. Untuk mencapai segala objektif dan menyelesaikan masalah ini. Mesin FT-iR digunakan untuk mengenal pasti isi kandundungan yang terdapat di dalam minyak pelincir.

DEDICATION

This thesis is dedicated to my parent, all of my lectures and all my friends for their support, advice and encouragement in completing this thesis. For my parents thank for the entire spiritual and support for me in order to fulfill the requirement for my studies.

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LIST OF ABBREVIATION

MMSB	-	Miyazu Malaysia Sdn. Bhd
ASTM	-	American Society Testing Material
FT-IR	-	Fourier Transform Infrared Spectroscopy
ATR	-	Attenuated Total Reflectance
JOAP	-	Joint Oil Analysis Program
ZnSE	-	Zinc Selenide
Ge	-	Germanium

CHAPTER 1

INTRODUCTION

1.1 Background Of Company

Figure 1.0: Miyazu Malaysia Sdn. Bhd

Miyazu Malaysia Sdn Bhd (MMSB), specializing in Automotive Tooling Engineering, Design and Manufacturing services, is currently the leading die provider for Proton cars. With more than ten years of experiences in the industry, MMSB now has tooling plants in Shah Alam and Tanjung Malim.

The automotive industry in Malaysia is an exciting business, with the constant needs for better innovation in tooling engineering and manufacturing field. By providing high quality products and services to its customers, Miyazu aims to further heighten the

By 2003, a decade in the industry, Miyazu have manufactured localization dies for Proton models: Iswara, Wira, Perdana, the New Waja, Arena and Gen-2. The company credibility, expertise as well as professionalism in the business have increased company profile among customers while attracting new customers as we progress through the years.

The company's growth potential is increased when Proton Holdings, Miyazu Seisakusho and Sojitz Corporation, Japan invested in company. A tripartite agreement was made and company became Miyazu Malaysia Sdn Bhd (MMSB) on 26th June 2003. Miyazu Malaysia started a new journey in August 2003 specializing in tool manufacturing and engineering services. Company latest portfolio includes the latest Proton Savvy, which is powered up with Lotus engineering. Proton Savvy epitomizes the fast and trendy lifestyle of the young Malaysian generations.

1.1.1 Product Produce

(a) Automotive Parts & Accessories
(b) Die & Tools Maker
(c) Engineering And Design Works
(d) Jigs & Fixtures
(e) Metal Stamping
(f) Mould & Die

1.2 Problem Statement

There are several significant problems regarding to the project that are existed in the case study: In the surface of product has a problem with dented. Lubrication is used to prevent dented during stamping.

(a) There is possibility of the oil used in the stamping operation at Miyazu (M) Sdn. Bhd. contain any particles that can cause dent problem on the material produced.

(b) There are possibilities of moisture existence in the stamping oil that can cause the oil insensitive and unfunctional when doing the stamping process.
(c) There is possibility that the usage frequency and oil age will be a factor that causes the oil become less functional.

1.3 Objective

(a) Objective of this project is to monitor oil quality and analyze the effect of water, oxidation, and soot contamination of stamping blanking oil.
(b) The condition monitoring of blanking oil is achieved by using FT-iR according to ASTM practice E2412-04.

1.4 Scope of the Project

The project will focus on improvement on the quality of stamped material. To ensure the objective is achieved, some of the important element must be considered:

(a) It is done at physics Laboratory in Faculty of Mechanical Engineering, Universiti teknikal Malaysia Melaka.
(b) To find contamination or other particle exist in stamping oil.
(c) Using FT-iR (Fourier Infrared Spectroscopy) JUSCO 6100, which is it will detect the moisture in the oil and also oil contamination.
(d) The sample oil taken at the blanking line in Miyazu Malaysia Sdn Bhd.
(e) The sample use is clean and used oil.

1.5 Metal stamping process

Figure 1.1: Stamping Machine

1.5.1 Introduction of Stamping

Stamping is a metalworking process by which sheet metal strips are punched using a press tool which is loaded on a machine press or stamping press to form the sheet into a desired shape. This could be a single stage operation where every stroke of the press produce the desired form on the sheet metal part, or could occur through a series of stages.

1.5.2 Common Stamping Operations Are:

(a) Piercing
(b) Blanking
(c) Bending
(d) Forming
(e) Progressive stamping

1.5.3 Metal Stamping Operation

Metal stamping processes use dies and punches to cut the metal into the required shape. The male components are called punches and the female components are called dies. Press machine tools are used in the stamping process. The die, made of hardened steel, has a contour that matches the shape of the finished part and is mounted on the table of the press. The punch, made of hardened tool steel or carbide, also matches the contour of the part but is slightly smaller to allow clearance between the die and the punch. It is mounted in the head or the turret, which moves down and punches the metal. The thickness of the sheet metal does not change during this process.

Progressive stamping is used to design complex profiles. In this process, the profile is cut in steps with a series of different sized die and punch combinations. The first punch in the series cuts a smaller profile and the next punch finely polishes the metal to obtain a desired shape. Tumbling process or deburring is used to remove any sharp edges and burrs. All through the process it is important to maintain a minimum wall thickness for the punched hole.

The metal may be plated with palladium, nickel or tin to protect it from oxidization. Plating improves the durability and solders ability of the product. For additional shelf life, the sheet metal is also pre-plated before the actual stamping process. The product is then cleaned to dispose of excess oils, grease, films or other materials used during the stamping process. The heating process follows the cleaning process to enhance the toughness of the metal product. In some cases, to ease the stamping process, the sheet metal is subjected to a stress relieving process that removes internal stresses in the sheet and improves its machineablity.

1.5.4 Metal Stamping Technique

(a) Several metal stamping techniques are extensively used in industries and engineering applications. Deep drawn stamping, Electronic stamping, Four slide stamping, Medical stamping, Progressive die stamping, Short run stamping, sizing, swaging, coining, and cold extrusion are some of the examples of metal stamping techniques

(b) Fine blanking is used when high accuracy is required. It is adopted when metal parts with smooth edges are to be produced. Fine blanking is a cold extrusion process not to be confused with stamping. This process is used to produce final shape parts that do not require subsequent finishing operations. Fine blanking process proves to be a cost effective as it is a single step operation.

(c) Progressive die stamping is a forming process that uses a series of dies to work simultaneously on the sheet metal. This process used to fabricate small parts at a fast pace. Progressive die stamping combines forming and cutting process, which saves time and money. Die stepping technique is adapted to stamp the sheet metal simultaneously. A series of dies is used to draw the sheet metal and all the dies stamp the sheet metal simultaneously.

(d) Deep drawing is used when recessed cavities in parts need to be formed. In this process, the sheet metal is subjected to plastic deformation by using a die and a punch. Once the yield point is reached, the metal starts to flow. A series of processes like sizing, blanking, swaging, etc. Factors like ductility of the metal, diameter to height of the component and corner radius play an important role. Using improper metal stock, a low quality dies, or excessive pressure can lead to defects like strains or ruptures that are immediately visible.

1.5.5 Metals Used In Stamping Processes

A lot of basic and exotic metals can be used for stamping applications because of their malleable and ductile properties. The metal should not be very hard and ideally should have a low coefficient of flow. Some typical metals include:

(a) Ferrous metals - stainless steel stampings, and other iron-based metals

(b) Non-ferrous metals - brass stampings, bronze stampings, zinc stampings, and other metals that are not iron-based

(c) Exotic metals - beryllium copper, beryllium nickel, niobium, tantalum, and titanium stampings

(d) Precious metals - gold, silver, platinum, which are often used for decorative stampings

1.5.6 Blanking process

Figure 1.2: Blanking Line

This project observe on the blanking process at the Miyazu Malaysia line, the problem when the product produce we can see the dent on the product, this problem was occurred might be caused by the degradation of lubrication oil. Blanking is the operation of punching, cutting, or shearing a piece out of stock to a predetermined shape by die cutting the outside shape of a part. Materials that can be fine blanked include carbon steels, alloy and stainless steels, as well as soft non ferrous alloys like aluminum, brass or copper.

1.5.7 Characteristics of Blanking Process

(a) Its ability to produce economical metal work pieces in both strip and sheet metal during medium or high production processes.

(b) The removal of the work piece from the primary metal stock as a punch enters a die.
(c) The production of a burnished and sheared section on the cut edge.
(d) The production of burred edges,
(e) The control of the quality by the punch and die clearance.
(f) The ability to produce holes of varying shapes.

The blanking process forces a metal punch into a die that shears the part from the larger primary metal strip or sheet. A die cut edge normally has four attributes. These include:

(a) Burnish
(b) Burr
(c) Fracture
(d) Roll-over

1.6 Ft-iR Spectroscopy JUSCO 6100

Figure 1.3: FT-iR Equipment

Infrared spectroscopy is one of the most important analytical techniques available to monitoring oil condition. One of the great advantages of infrared spectroscopy is that virtually any sample in virtually any state may be studied. Liquids, solutions, pastes, powders, films, fibers, gases and surfaces can all be examined with a judicious choice of sampling technique. As a consequence of the improved instrumentation, a variety of new sensitive techniques have now been developed in order to examine formerly intractable samples. Infrared spectroscopy is a technique based on the vibrations of the atoms of a molecule. An infrared spectrum is commonly obtained by passing infrared radiation through a sample and determining what fraction of the incident radiation is absorbed at a particular energy. The energy at which any peak in an absorption spectrum appears corresponds to the frequency of a vibration of a part of a sample molecule. In this introductory chapter, the basic ideas and definitions associated with infrared spectroscopy will be described. The vibrations of molecules will be looked at here, as these are crucial to the interpretation of infrared spectra.

1.6.1 FT-iR Reflection Techniques

Reflectance techniques may be used for samples that are difficult to analyze by the conventional transmittance methods. Reflectance methods can be divided into two categories. Internal reflectance measurements can be made by using an attenuated total reflectance cell in contact with the sample. There is also a variety of external reflectance measurements which involve an infrared beam reflected directly from the sample surface.

1.6.2 Attenuated Total Reflectance Spectroscopy

Percheranier, and Vuarchex, (1998) stated that ATR is the simplest to handle, and its main limitation is that it provides a spectrum where the spectrum intensity across the spectrum increases as a function of wavelength. Attenuated total reflectance (ATR) spectroscopy utilizes the phenomenon of total internal reflection A beam of radiation entering a crystal will undergo total internal reflection when the angle of incidence at the interface between the sample and crystal is greater than the critical angle, where the latter is a function of the refractive indices of the two surfaces. The beam penetrates a