SOLVING PROBLEMS UNIVERSITY INDUSTRY

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Abstract

Teaching students in a very competitive world is not an easy task. Nowadays, the production takes place in a global world, and we have to teach students to face each time a more difficult environment in their professional development. They have to compete with technologies and people, from all over the world.

These new paradigms bring a challenge to the Universities in order to prepare students for the real world.

A close collaboration with the industries is essential in order to give the future graduates skills, to be able to solve problems, each time more difficult and challenging.

One limitation of the University is the lack of high production's machinery that is used throughout the industry.

At the Faculty of Chemistry (Universidad Nacional Autónoma de México), we have been able to come in close contact with several Industries to solve together problems they are facing now, in order to increase production and reduce costs, in their fabrication processes to be more efficient and competitive.

Keywords: Polymer, industry, processing.

1 INTRODUCTION

Many technological operations are applied in the processing of polymers. Calendering is one of the operations that are applied to transform the bulk polymer in a finished material. The production rate can be very high up to several tonnes per hr. Translates into an elevated capital investment in machinery and buildings. Because the calenders are made of heavy steel rolls, weighing up to 20 tonnes each, they can last a very long time; some calenders have been in operations for more than 100 years.

2 OBJECTIVE

The main objective of the course is to teach students; how it is possible to obtain valuable information from the literature and other types of documents as patents, to find different alternatives to solve an industrial problem in a simple way, even if they are not familiar with the problem. A team of five students were given the objective of solving the problem of changing the parameters of an old rubber calender to be used in the modern production of PVC (Polyvinyl Chloride).

3 METHODOLOGY

Calendering is one of the oldest rubber processing technologies. It consists of a mechanical process by which rubber is laminated into a textile by pressing it at very high pressure, to form composite sheets.

The word “calender” is a derivation from the word kylinros the Greek word that is also the source as the word “cylinder”

The patent literature is a very effective way of finding information in the distinct branches of Industry. With this in mind, a complete search was done in the literature patent in order to find information about calender and how different factors affect the process of film production.

One of the first applications of the vulcanization of the rubber process was bonding rubber to a woven cloth as reinforcement to make waterproof sheeting. This process required that the two materials accurately squeezed between rollers at high pressure.
In August 1836, it was filed the patent No. 16 by Edwin M. Chaffee of Roxbury, Massachusetts for producing a large machine for “Application of Caoutchouc to clothes, leather, and other articles” [1]. This “monster” weighed 30 tonnes and had a roll face width of 1.52 m.

It was the first patent for a machine capable of transforming raw rubber into a sheet for different uses.

The uses of such devices were developed extremely fast, and one of the very best-known calenders was constructed 13 years later and was used in England, this calender is now at the “Bristol Industrial Museum” [2], after more than 100 years of continuous use. Modern machinery with highly sophisticated controls is used today in Fig. 2 a new calender from Rodolfo Comerio (Italy) one of the largest calender builder is shown. [3]

After review the literature it was found, by the students, that the most important parameter in adapting an old rubber calender to produce PVC was the crown of the rolls. Crown is the difference in diameter between the ends of the roll to the centre, and also the shape is very important to produce a uniform sheet of plastic.

In Mexico City, a small company wanted to change his rubber calender to PVC (Polyvinyl Chloride): the problem is that the thickness of the plastic was very uneven. The Student started to find information and found that the forces developed in the nip between the rolls are very high and even that the cylinders are massive, they tend to bend. And this is presented in a larger proportion with smaller film thickness.
Fig. 3 shows the calender that has to be adapted.

In order to solve the problem after finding the cause, was the way to give the right answer, finding a simple and efficient device that could change the shape of the rolls in situ.

With a search through the patent literature, several solutions were found. One of the first devices to roll polishing or grinding was done in 1898, it consists in a supporting frame attached to the housing of the rolls, a traversing mechanism placed inside the frame and adapted to being moved back and forward horizontally, combined with elastic arm upon its inner end, and holders for the polishing or grinding material secured to opposite ends of the arm. This device was very effective since the beginning of the century for polishing rolls. [4]
50 years later, a more elaborated device was developed for roll grinder and polishing, with patent 2,461,459 that was filed on Aug. 6, 1946 and granted 8, Feb. 1949.

The aim of this patent was to provide a novel grinding and polishing device for rolls which was portable and may be used to refinish and resurface rolls in the field without removing the rolls or dismantling the calender in which they are incorporated. Furthermore, it was important to have a relatively simplified and inexpensive construction and be highly effective and efficient in operation and use [5]
4 RESULTS

The team of five students with the help of an industry technician, and the supervision from the university staff were involved in the actual polishing of the rolls and after a week of hard work, it was possible to develop the right profile of the cylinders and able to obtain flexible PVC with a uniform thickness of 0.025 mm. This was a real achievement among the students; they had a field operation, and could solve a practical problem, been in contact within the industry; a new way of learning is developed.

They agree that this approach gave them better tools to understand the different courses at the University, and learn the importance of small details to accomplish a solution. This hand on practice was recognised as one of the best realistic learning they had during their university courses.
This new approach taken at Universidad Nacional Autónoma de México, after 9 semester of learning theory and laboratory practice, having a real world experience give them the opportunity of finding very fast, a well-paid job within the industry, after completing their degree.

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REFERENCES