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The method of building the experimental setup for material engineering subject

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Abstract: According to a survey conducted by the Ministry of Education and Training, in 2011, 63% of students were unemployed due to lack of skills. For objective reasons students did not adapt to the work environment when they were surveyed, the reason "the content of study at the school is less practical, but more theoretical" with 49.2 % students choose. Enterprises have difficulty in recruiting labor force when graduates are not really active in their jobs. This causes a direct barrier, which makes it difficult for students to adapt to their work environment, as well as in their future career. Internship is the testing process, so that students complete the basic skills, in order to work effectively when becoming a formal employee. In practice, the students still have difficulty adjusting to the work environment in the internship, and the results show that most students are not ready for internships.

Keywords: experimental skill, career, work environment, subject

1. Introduction

The biggest constraint in students when adapting to the practical content is the problem of planning, penetrating the actual activities of the profession or job; understand the operation of the unit; use, apply knowledge, skills learned in the real work environment, and soft skills, from writing emails, using photocopiers. In the difficulties of adapting the conditions and facilities in the working environment when practicing, the most noteworthy is the use of means, tools, and machinery to work. The "use of printers, fax machines, photocopiers and other office facilities" is up to 58% at medium to very low levels. In addition, the content of "use of machinery, equipment, technical means related to professional production" has 56% of students have not adapted well. Notably, the language skills of students are rated the lowest, 43.3% at medium and low.

Study material is the basic subject of all engineering disciplines, especially mechanical engineering. Through this course students are able to acquire basic knowledge of animal science including:

Theory of structure of materials

The relationship between the structure of the material and its properties. This is a matter of the most important attribute of the science of materials. These relationships allow the assessment of the nature, applicability and reliability of materials in structures, components and

Methods of selecting the appropriate materials according to each specific requirements of production. In addition, the science of materials also shows the direction to create new materials of new nature to meet increasingly higher suited to the development of science and technology.

Starting from the above we see that science is a science that is of great importance to all the engineering disciplines. Understanding the science of materials allows engineers to handle highly practical situations. Therefore it is an indispensable subject for engineering students. The importance of materials science has been identified by the party and state as one of the four science and technology priorities in the development, consistent with their trend of scientific and technological development. the world in the new age. The specialty of material science is research derived from technical requirements. Finding new properties of materials or creating new materials takes a lot of time to perform experiments. The quality of the material is assessed through their actual working process. In order to achieve high reliability of materials, the experiments must be of high precision and the level of close to reality must be ensured. On the other hand, the study of materials is essentially a study of their internal structure, through an internal structure that evaluates the properties of the material. The study of the internal structure must also be done through experiments, fully practiced to verify the accuracy of the theory of material science. Briefly, the science of materials is the science that always requires explicit results of experiments, the study of materials science cannot be separated from the practice, the experiment. Derived from that characteristic of materials science, in the content of the material course of practice, experiments play a very important role. Through experiments, students will learn more deeply about the classroom. It is important for students to grasp the methods of conducting research in materials science. On the other hand, through experiments and practice, students are also familiarized with and practiced using research equipment, thus creating the ability to work for students after graduation with high efficiency. In order to improve the quality of training of students, especially students of mechanical engineering in the field of study of material science, the development of standard practice tests suitable to each training sector is very

necessary. In this paper, we go into the development of standardized tests and experiments in the field of training (first of all mechanical engineering). Through the experiments, standard practice and based on the flow of students, the topic to design a practical classrooms for study materials to ensure modernity, timely updates, new problem for students. At the same time, it also serves effectively for scientific research and production work of the school. However, due to the limited time and the level of education, there are still many obstacles in the subject.

Figure 1. A material lab testing at a university in the world

2. Analysis of the chemical composition of the material

The chemical composition of the material determines the formation of differently structured materials. Therefore, the chemical composition of the material has the greatest impact on the creation of new properties for the material itself. Alloy elements appear in steel with specified concentrations that allow the production of structured and individual steels. There are alloy elements that are introduced in different grades to produce different types of steel. Chromium, when introduced into steel with medium and small content in low carbon steel, is mainly used to increase the penetration of the component, but with high carbon content, it produces high wear resistance due to the formation of various types. Highly dispersible and highly rigid bits [type (Fe3Cr3C)] are ball bearing steel. With a chromium content of up to 1.5% and a C content of up to 1% in steel, we obtain very high abrasion resistant steels, very high permeability used in the manufacture of cold presses, the type of prototype need high precision in mechanical manufacturing. When steel is up to 13% or (25-28)% Cr and low carbon content <1%, we obtain high corrosion resistant steel, such as magnesium (x13) or pherite x25, x27, x28 ...). Thus, only one alloy element produces a lot of different properties for steel and therefore has a different function. Because of the importance of such large alloy elements, a very important and indispensable requirement is to analyze the chemical composition of the material in general and steel in particular.

Analysis of the chemical composition of the material is extremely significant as follows:

Allows identification of organizations formed in the material on the basis of reducing the status of picking alloy systems.

Helps the user grasp the basic properties of the material through which to create

Use appropriate measures to handle the material.

In the repair of equipment helps technicians find materials instead so quickly and accurately.

Allows to assess the rationality, reliability of the detailed structure using materials.

Ensure quality assurance, quality assurance, and especially technological options that are best suited to each type of material. In addition, the analysis of the chemical composition of materials, especially the rapid analysis, allows the change of the content of alloy elements right in the production process to create the best quality alloys in love. bridge. With these important implications, the practice of chemical analysis is intended to reinforce the knowledge of alloying in general materials and of metal and steel in particular. At the same time, students learn basic methods of analyzing chemical composition of materials.

Theoretical basis of chemical composition analysis methods of materials

Basic methods for analyzing the chemical composition of a material include:

Analytical chemistry is the method of using chemical reactions to determine the presence of elements through the products obtained after the reaction (for qualitative analysis) by conventional tests (measured by sample weight and product weight obtained). We can obtain quantitative results. The characteristics of this method have the disadvantage that the speed of analysis is slow and the results are not perfectly characteristic. The samples must be in the form of chips so it is necessary to have the equipment to prepare the specialization (lathe, machine drilling ...) in order to carry out analytical work with high quality, it is necessary to have staff trained in the field and have sufficient experience.

Spectral analysis method is a method based on the generation of spectra with different wavelengths of elements when burning and resulting in spectra accurately reports the presence of elements in the composition of the material. As quantitative analysis is based on comparison with the standard distribution chart of the spectrum occurs. The results are processed by the available software we will have the results of degrees with high accuracy. The characteristics of the spectrum analysis are: fast analysis results, high accuracy, especially convenient for metallurgical processing or testing in the field. Samples can be taken at any location for higher representation.

3. Modeling to study metal structure

3.1. Purpose and requirements

Modeling for microscopic studies, the design of the following stages: sample selection, sample cutting, polishing and finishing. Understand the importance of sample preparation for research and its impact on research results. Be familiar with the materials and equipment needed for the fabrication work.

3.2. Sample fabrication

Choose sample and cut sample: Sampling is important because the sample must be representative of the material to be studied and meet the research requirements.

Sample cutting can be carried out in the type of cutting machine, hand sawing machine, most commonly used in lathe and milling machine. Hard samples like steel after I have to cut with grindstone. The sample should be cooled well to avoid organizational change due to heating. Finished samples must be chamfered so as not to tear the paper when grinding. The sample shape is usually cylindrical with a diameter of 12 mm, a height of 10 mm and a cross section of 12x12x10 (mm). In fact, the size of the sample is not always the same. Usually the size of the sample depends on the size of the detail or the semi-finished product carrying the study. Small sample sizes are inconvenient during sample preparation and, when observed, the sample surface is clamped and the mounting or molded objects are in place.

Grinding: It is carried out in the paper from rough to smooth. Usually use three types (or four types) of different degrees of activity. Armor is placed on a thick plate to be grinded flat. When grinding, pay close attention to the pattern on the paper. If the planar surface and the blades are parallel in one direction, they can be transferred to a finer sheet of paper. Once turned to smooth paper, the specimen rotates 900 degrees to the finish of the fold. Grinding before and on the surface of only the stain lying parallel to each other we turn to smooth paper and continue on to the last sheet of paper.

Polishing: Different polishing methods can be used such as mechanical polishing, mechanical polishing and electrolyte polishing. Mechanical polishing is carried out on a polishing machine. When polishing the handles firmly pressed slightly and evenly grinded. Regular grinding of the grinding fluid is achieved by means of ducts and valves for quick grinding and non-heating. Polishing until the surface has no scratches. The polishing process should not be too long because the organizational components such as graphite, non-metallic beads, discoloration can be removed. After washing the sample, wash it thoroughly. Before finishing, polishing should be done by observing the microscope drive if there are many scratches to be repaired.

Electrolyte polishing: This method is used quite commonly because it has advantages over mechanical polishing: avoiding the change of organization of the surface when polishing according to the principle of: in the electrolyte and connected to the poles of the two power sources, and the pole (-) is a plate of zinc or nickel located a certain distance from the surface of the sample. When the current density is large enough, the underside of the sample is dissolved and the surface is flat. Some common electrolyte polishing modes are given in Table 1.

Table 1. Some common electrolyte polishing modes

No	Alloys	Electrolyte solution	Electrolyte modes			
			Current density (A/dm^2)	Voltage (V)	Temperature (^oC)	Time (mins)
1	Black alloys	800 cm^3 H_3PO_4 (1.54); 100 cm^3 H_2SO_4 (1.84) 100 cm^3 H_2O	39-40	1.1-1.8	75-95	7-12
2	Copper	H_3PO_4 (1.48)	2.5-3.0	1.1-1.8	15-18	10-20
		H_3PO_4 (1.55)	1.75-2.3	1.1-1.8	15-18	10-20
3	A phase-brass copper (α)	H_3PO_4 (1.48)	3-6.5	1.2-1.8	15-18	10-15
		H_3PO_4 (1.55)	2.5-3.0	1.3-1.9	15-18	10-18
4	2 phase-brass copper ($\alpha+\beta$)	H_3PO_4 (1.48)	5	1.4-1.6	15-18	10
		H_3PO_4 (1.55)	4.5	1.3-1.7	15-18	10
5	Aluminum latong copper	H_3PO_4 (1.55)	4.5	1.6	15-18	5
6	Tin latong copper	H_3PO_4 (1.55)	4.5	1.6	15-18	
7	Tin	194cm^3 $HClO_4$ (1,54)	9-15	25-40	20-30	
8	Aluminum	Cu_3CO_3 - 785mm^3 $HClO_4$ (1.48) 215 cm^3	3-5	2-100	45-50	15

Impregnation: After polishing, if the specimen is placed on an observation microscope, only the background is bright because the pattern is flat and the light reflection in all places is the same. Only polished, non-metallic, graphite, and some other phases in the metal can be studied in the sample after polishing. In order to study the metal base, it is necessary to impregnate the sample with a suitable chemical solution called a real solution. When soaking the sample surface dipped in solution or using bamboo stick or glass rolls dipped in cotton dipped in real solution and then applied to the sample surface. Actual cooking time depends on the organization and thermal state of the sample. For steels and cast irons in steady-state equilibrium time of 5-10 seconds. Real time can also be determined by experience, when the real food always observe the sample surface, if the sample surface from shiny to matte color is considered to be able to finish real. When impregnating, different phases of alloys with different degrees of corrosion, the onset of undersurface on the sample surface should be observed as viewed in the microscope due to the different light reflectance of the sample surface. After soaking the sample must be washed with water, after washing with alcohol, drying with a hair dryer or hot wind

4. Conclusion

Derived from the characteristics of materials science, experiments play a very important role. Through experiments, students will deepen their knowledge in the classroom. It is important for students to grasp the methods of conducting research in materials science. On the other hand, through experiments and practice, students are also familiarized with and practiced the use of research equipment, thus creating the ability to work for students after graduation with high efficiency. In order to improve the quality of training of students,

especially students of mechanical engineering in the field of study of material science, the development of standard practice tests suitable to each training sector is very necessary

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