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Analysis of Production Line of a Product in State Company of Electrical industries

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Abstract

The international industrial products become basically dependent on firstly, the quality, secondly the quantity. Hence, the relative importance of quality becomes the basic factor in industrial products for the deep effect on -creating the competitive spirit between the production companies, for obtaining international markets.

This research aims to analyze the technology method to synthesize the products. That's to identify the quality control point dependent in the manufacturing stages from one side and standing on the critical properties for these products from the other side and that affects directly its operative efficiency.

The state company of electrical industries was selected as the
application place for this research due to the following reasons:-

a. For seeking increase in their products.

b. For the pulsing happened in their products quality.

الخلاصة

أصبح الإنتاج الصناعي العالمي يعتمد أساساً وفي المقام الأول على النوع وثم في المقام الثاني على الكم أي ان الأهمية النسبية للنوعية أصبحت العامل الأساس في الإنتاج الصناعي لما لها من تأثير عميق في خلق روح المنافسة بين الشركات المنتجة في كسب الأسواق العالمية للتصدير وفتح أسواق جديدة.

يهدف البحث إلى تحليل المسلك التكنولوجي لتصنيع المنتجات وذلك للتعرف على نقاط السيطرة النوعية المعتمدة في مراحل التصنيع من جهة والوقوف على الخصائص الحرجة لتلك المنتجات من جهة أخرى والتي تؤثر بشكل مباشر على كفاءتها التشغيلية. لقد تم اختيار الشركة العامة للصناعات الكهربائية كحالة تطبيقية للبحث الأسباب التالية:

أ. لزيادة الطلب على منتجاته.

ب. للتذبذب الحاصل في نوعية منتجاتها.

1- Introduction

The field of quality control has undergone major development over the decade of the 1980. Since it was first born as a specific displine in the 1920, quality control has taken its place as a central activity in the industrial system. Most industrial organizations, at least through the 1970, had a "quality control" manager of a "quality control" department, which had a function to administer "quality control" manual. The American society for quality control has been in existence as a major national organization since 1945 (Richard, 1992; John *et al.*, 1995).

Quality control is an effective system for integrating the quality development, quality maintenance and quality improvement efforts of the various groups in an organization so as to enable production and service at the most economical levels

extending fall customer's satisfaction (Chase and Aquilano, 1981; AHuJA, 1993).

2- Quality Control

Control is the process by which we establish and meet the standards that ensure quality. Establishing control requires seven universal steps (Juran, 1974; Franklin and Thomus , 1980).

1. Select the person, process, and tool to be controlled.
2. Choose a measurement that can be applied to the control subject.
3. Create a measuring device.
4. Set a standard value for this measurement that will gauge the presence of the desired quality.
5. Conduct the actual measurement.
6. Interpret the differences between the measurement and the standard.
7. Act on this information to improve quality if necessary.

2-1 Quality Control Function

The function of quality control is to prevent, detect, and correct or service defects that would make the product or service fit for use. Figure (2.1) shows the role of a quality control system in a production system. Thus, quality control has several objectives (Chase and Aquilano, 1973; James, 1993).

1. To ensure that purchased material, quality maintenance and quality improvement efforts.
2. To maintain conformance to design specifications throughout the manufacturing process or during the delivery of a service.
3. To achieve the highest possible quality level for the final product or service.
4. To improve productivity by reducing scrap and rework in manufacturing and the number of complaints and returns from customers.

2-2 Elements of Quality Control

The elements of quality control gear right in with the production and service processes. The elements of quality control can be classified as follows (Francis, 1987; Eugene ,1988; Firas, 2000).

1. New-Design control.
2. Incoming-Material control.
3. Product control.
4. Special process studies.

2-2-1 New-Design control

Here the quality control effort is on a new product during the selection of marketable characteristics. The design parameters are being established and provided by prototype tests, the manufacturing proces3 is being planned and initially cost.

2-2-2 Incoming-Material Control

This control represents the procedures for actual acceptance of materials, parts, and components purchased from other companies or, perhaps, from other operating units of the same company.

2-2-3 Product Control

Product control involves the control of products at the source of production so that

departures from specifications can be corrected before defective products are manufactured. It does not only involve the materials and parts but also involves a control of the processes that contribute to the quality characteristics during the manufacturing operation.

2-2-4 Special Process Studies

It is concerned with investigations and tests to locate the causes of defective products. Elimination or control of these causes results in product and process improvement, not only in improving quality characteristics, but also reducing costs of production. Figure (2.2) shows how the quality control elements gear in with the production.

3- Classification of Defects

In many manufactured goods, more than one type of defect may be present on which the decision for acceptance or rejection can be based.

Some defects are more significant than others and therefore, some classification is required (John, 1992; Cengiz, *et al.*, 2000).

1. Critical defects.
2. Major defects.
3. Minor defects.

3-1 Critical Defects

This class of defect is based upon experience that a failure in service brought about by such a defect could result in situations where individuals would be at risk.

3-2 Major Defects

This class of defect could result in failure, which could seriously impair the intended function of the product.

3-3 Minor Defects

This class of defect is not likely to reduce the effectiveness of the product, although non-conformance with specification is present.

4- The Most Important Products

The company has introduced new products such as set up of the central air condition systems but it has produced only few units and the collection line for the fixed part of the freezer compressor card (500) part a day. Also the company has introduced (under a contract with the company of westing house) air cooler motor with its four types (1/4, 1/3, 1/2, 3/4) horse. In addition to the production lines of all water cooler of different sizes, the electrical light devices and the wires and lightning requirements, the water pumps specific for the coolers and Al-Naseem ceiling fans. While its production for agricultural pumps remained on need or on the availability of the materials.

5- The Space and Limits of Practical Application

According to the aims of this thesis, the researcher selected the following production lines: -

1. The shaft of the air cooler motor.
2. The rotor for Al-Naseem ceiling fan.
3. The stator of the water-pump of air-cooler.

That is because of the influence of manual works, which are of at most importance on the productivity because of the difference in the performance rate of workers. In addition to study and analyze the technological method followed

into synthesizing these parts with observing the follow-up system for the production in use.

5-1 The technological method to manufacture the shaft

The raw material for the shaft will be in the form of rods. of steel in the length of (4) meter and a diameter of (16.38) mm. These rods will be introduced subsequently into the automatic turnning machine till the determined length of the shaft and turnning begins on the outer diameter

for the rod in subsequent stages by using carbide cutting pencils. After finishing the turnning operations, the shafts will be transferred into the polishing machines, and polishing will be done in two stages by using two isolated field machines, in the first polishing will be done by a coarse stone of the type (19A.60K), and in the second with a fine stone of the type (19A.100JV), where polishing is done for the diameters determined in the designing map, and figure (5.1) shows the designing abilities for the outer diameters of the shaft.

While the blackening operation is in the last stage to operate the shafts in subsequent pools, starting with reservoirs containing sodium hydroxide base in order to remove the soils and the Raysh residues hold on it and then immersing it in water tanks and then transporting into pools containing the suffering and the alkaline traces and then washed in water pools another time before introducing it into the blackening pools which contains a mixture of variable ratios from sodium nitrate, sodium nitrite and sodium hydroxide ($NaOH+NaNO_2+NaNO_3$). The temperature of this mixture is ($135C^{\circ}$) by which the shaft surface is oxidized by the blacked color iron oxide, and therefore it is called the blackening operation.

Figure (5.2) shows the technological course for the synthesis of the shaft and blackening operation place in it.

5-2 The technological method to manufacture the rotor

The raw material for this part are electric iron plates with (0.5)mm thickness of one meter width and (100) meter length, then it is cut into plates known as the plates of rotor commonalty using special presses and with constant dimensions as in the figure (5.3), then they will be assembled (30) piece of such plates each one on the other and with a height of (15) mm and an angle of (30.30 ± 1) using a special arrangement to form the core of rotor.

Then the assembled parts are sent to foundry and put in the Aluminum injection machine to inject cores with Aluminum of (99.5%) purity in order to form the rotor part and then sending it into the turner operation and according to the dimensions and diameters fixed in the map as shown in figure (5.4).

So the cores will be ready for assembling with the main shaft. Figure (5.5) clarifies the technological method to manufacture the rotor part core.

5-3 The Technological Method to Manufacture the Stator

The raw material for this part is coils of electric iron plates which are cut by special presses into plates called the plates of stator part and figure (5.6) shows that, then these plates will be assembled over each other through automatic machine working to press and solder the plates which are (52) plate in number of electric iron.

Then it will be sent into the coiling and insulation part which is an integral assembly line having ordered work stations in series. Then insulators, conduction wires will be added and rolling the coils with automatically then they will be sent

into the immersion parts and assembling to immerse it in an adhesive material which is an electrical insulator called (varnish) which helps in the adherence of the stator coils with each other and also acts as an electrical insulator. Then they are dried and sent into the main water pump assembly line and figure (5.8) shows that. So the stator will be ready for assembling with the rotor. Figure (5.8) clarifies the technological method to manufacturer the stator.

6- Conclusions and Recommendations

1. External diameter of shaft of both front and hind ends have an effect on the efficiency of motor work, because it represents the place of the rolling inside the linning.
2. Internal diameter of rotor of the ceiling fan (Al-Naseem) has an effect on the efficiency of fan work, because it effects the size of air-gap which is besieging between rotor and stator.
3. External diameter of stator of the water pump of air-cooler has an effect on the efficiency of water pump work, for pressing inside water pump from on wanted diameter.
4. Immediate and continuous observation to get any gradually or suddenly variations which may happen as a result of producing process by taking samples of product and c1-.:eck or test to insure that all variation happen between producing units are included within permissible tolerance limits.
5. Supervision on inspection processes through manufacturing processes, partial and final collection.
6. Simplifying the measuring process and devices which have been tested by changing the approximate Micrometer device and tested on developed device which can register the data, and at the same time can give the digital direct readings.

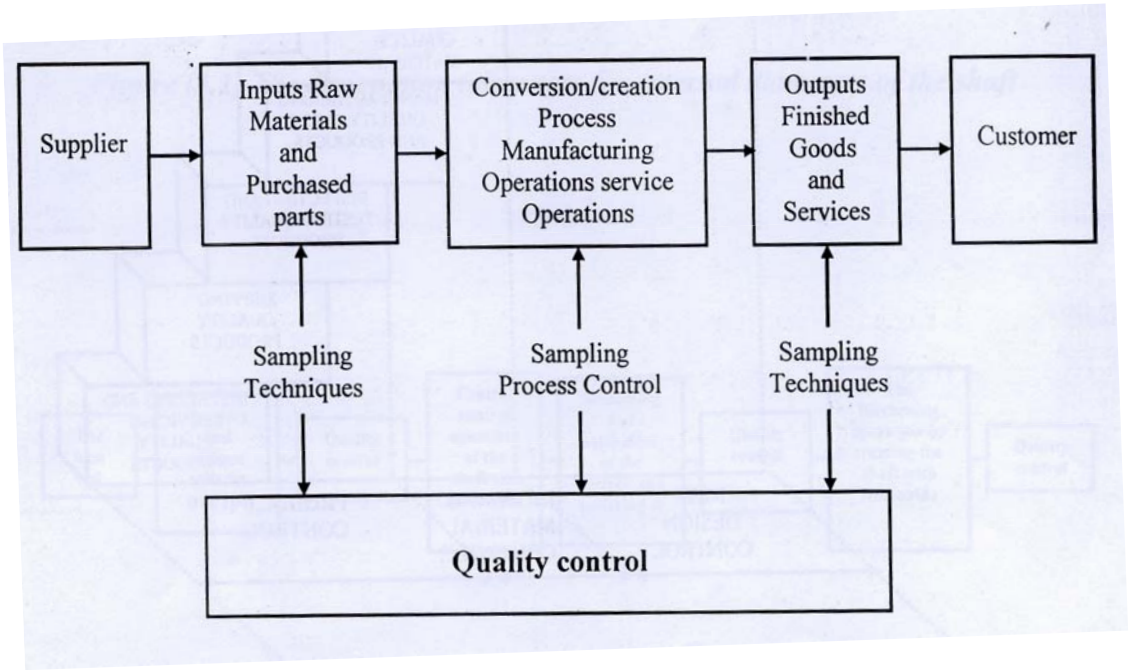

Fig (2.1)The meaning of quality control (James, 1993).

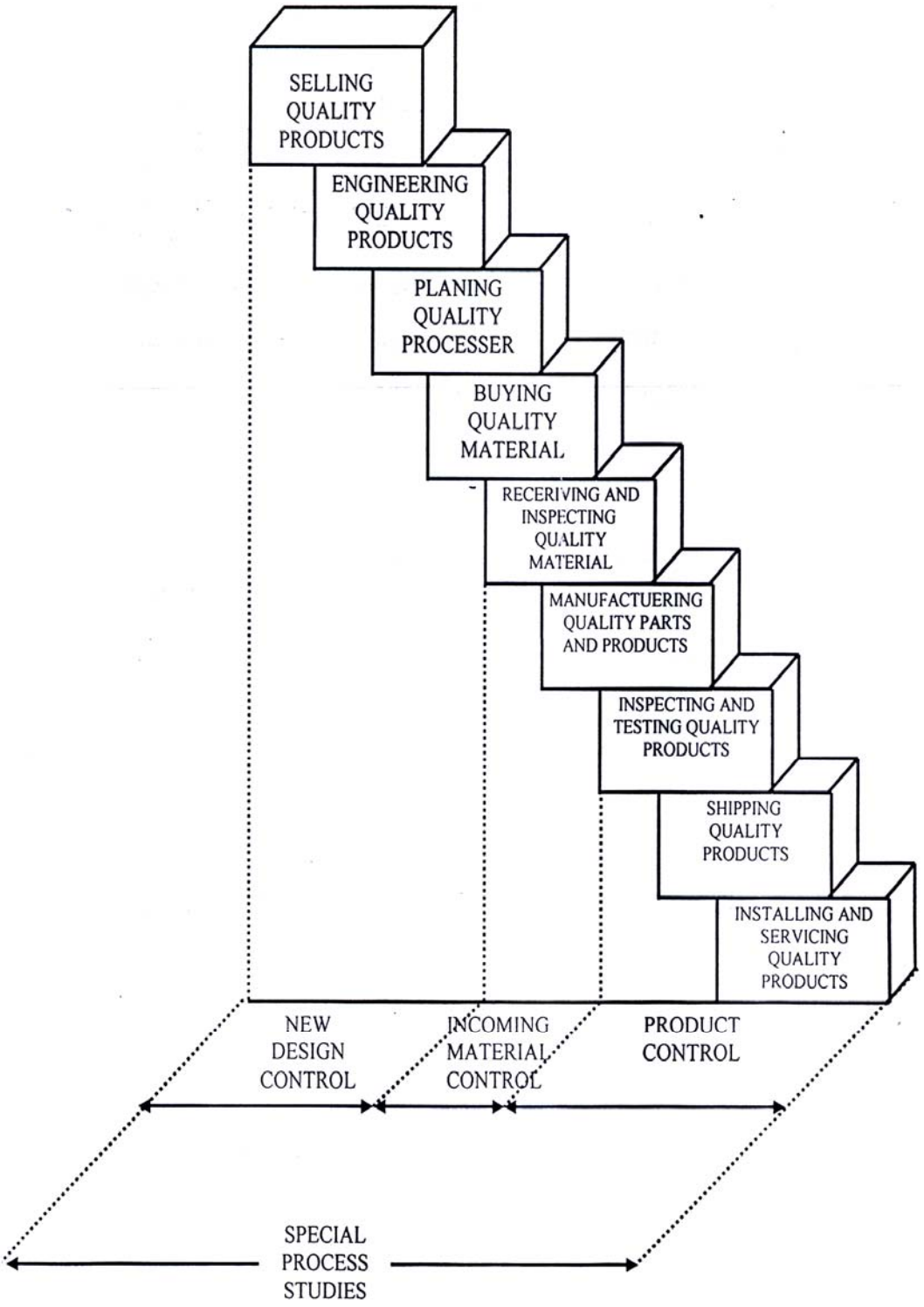

Fig. (2.2) Quality control activates during the production cycle (Firas, 2000).

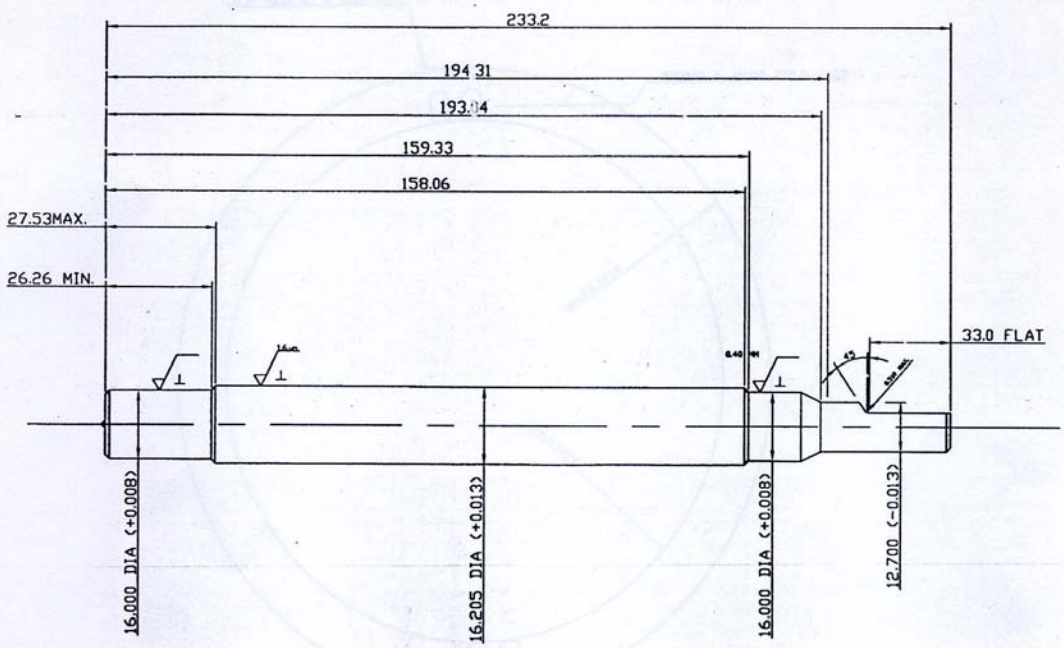

Figure (5.1) The designation tolerances for external diameters of the shaft

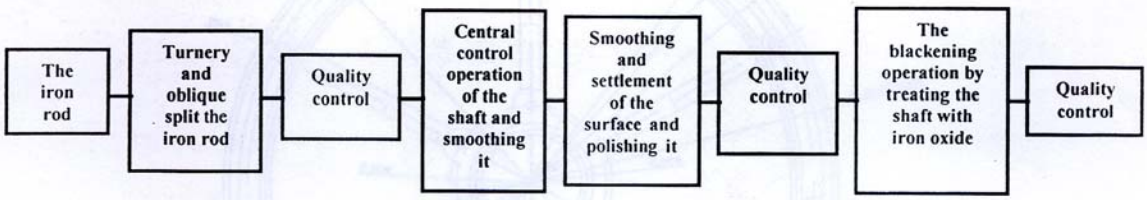

Figure (5.2) The technological method to Manufacture the shaft

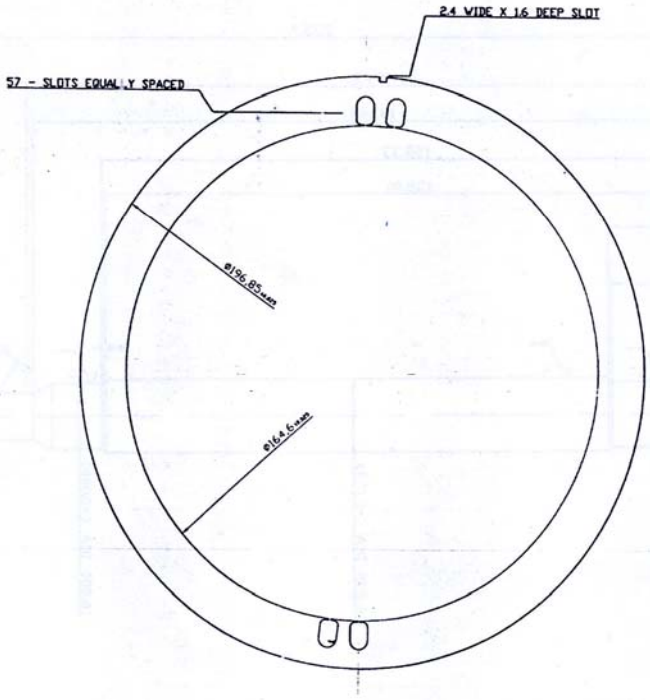

Figure (5.3) Rotor Lamination

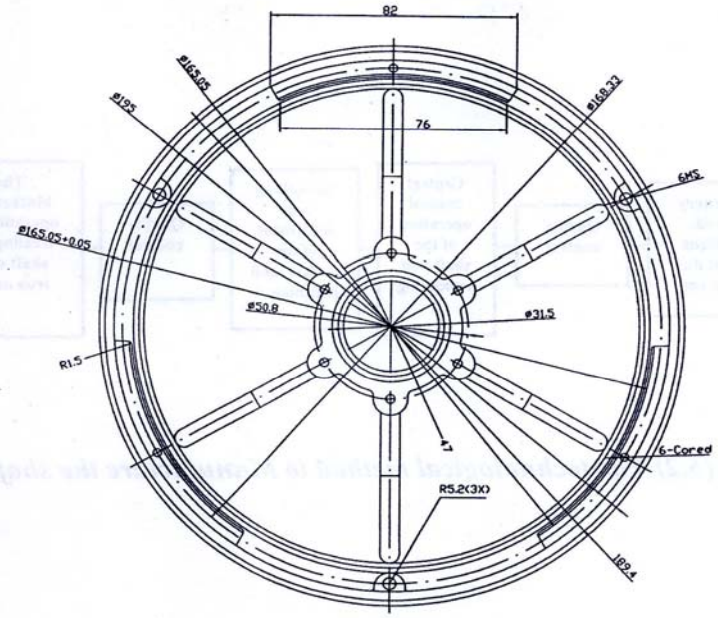

Figure (5.4) Rotor for Al-Naseem ceiling fan

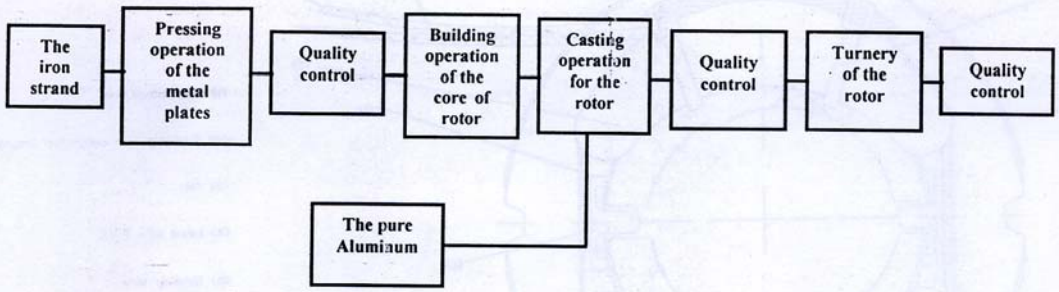

Figure (5.5)The technological method to manufacture the rotor

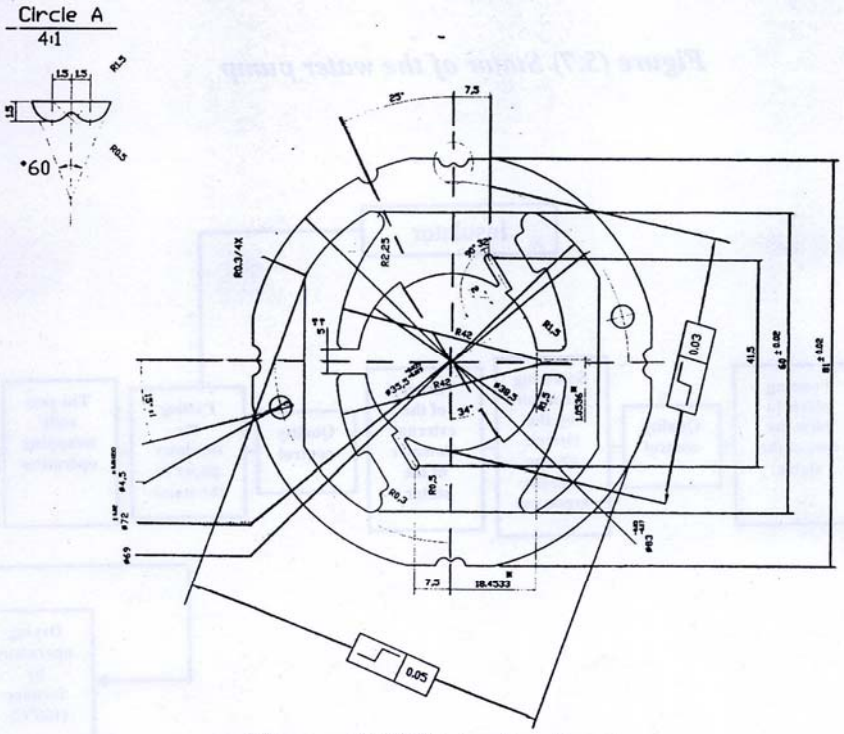

Figure (5.6) Stator Lamination

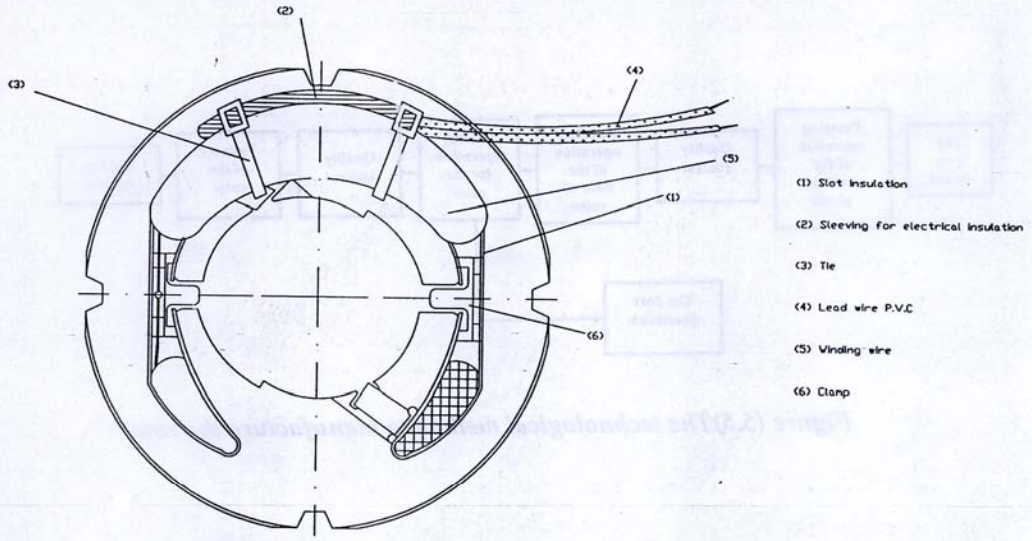

Figure (5.7) Stator of the water pump

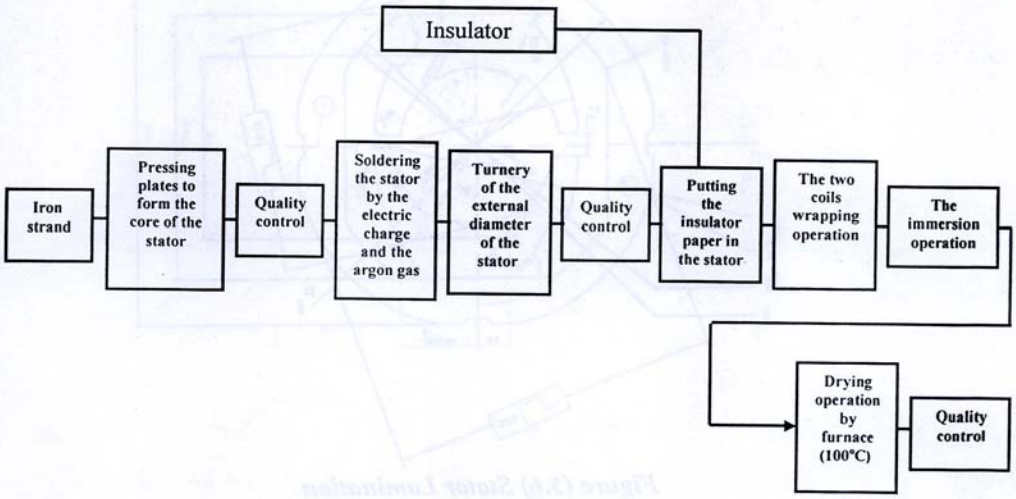

Figure (5.8) The technological method to manufacture the stator

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