SOME NON-TRADITIONAL STEPS IN LABORATORY CLASSES FOR ENGINEERING CURRICULUM

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1. INTRODUCTION

It has been learnt that the traditional steps for conducting laboratory classes in engineering curriculum, e.g. supplying instruction sheets for each experiment to the students, checking the working procedures followed by the students etc., give a positive effect on the students' performance in the laboratory. The authors, here point out some non-traditional steps taken by them, specially in the area of electrical engineering laboratories. Any non-traditional step, for implementation in laboratories faces some difficulties but long-term exercise of these steps clearly show some of the good effects on the students' performance.

2. THE NON-TRADITIONAL STEPS :

The steps taken by the author in the laboratories are :

i) Not to supply the instruction steets to the final year undergraduate and postgraduate students.

ii) To modify the existing experiments to some extent for enhancement of the students' thought process.

iii) To avoid or minimize the purchasing of the electrical machines/ equipments which are of black-box type with only working terminals bought out with push-button type switches.

3. DISCUSSIONS ON THE STEPS:

Step 1 :

Not supplying the instruction sheets to the final year undergraduate and post-graduate students does not mean simply not to feed the students any information regarding the particular experiment. The sub-steps for implementing the above steps are:

(a) To arrange some additional classess and the academic materials regarding the experiment should be explained in the class in a well fashioned manner. In some topics, combined lecture and laboratory work will make the jobs of teaching and learning very efficient with respect to time and effort.

(b) To instruct the students to prepare notes on the particular experiment

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in their own language and submit to the teacher concerned on the date, one week (minimum) before the date of the laboratory class. The notes to be prepared by the students should be divided into : i) Aim of the experiment, ii) Theory, iii) Circuit Diagram, iv) Procedure.

(c) For implementing sub-step (b) the teacher concerned should give necessary information to the students about the reference books and journals.

(d) The concerned teacher should check the assignment and give back it to the student on a day minimum two days before the date of the laboratory class. While checking the assignment the points to be remembered are :

i) For undergraduate student, one should mainly check whether the student possesses the correct fundamental idea about the experiment or not,

ii) For the post-graduate student, emphasis should be put on his fundamental idea and ability to analyse them clearly.

By implementing the above four sub-steps, the work-load of the teachers concerned will be increased compared to that in the traditional method of supplying once, in an academic year, the instruction sheets to the students. But the main positive effect is that the self-confidence of the students will be increased and this will obviously better their career while working in a shop-floor after passing out from the institution.

Though the authors have implemented the above non-traditional steps to the final year laboratory classes, it can be also implemented to the first, second and third year laboratory courses. The emphasis should be put more on the final year students, because after studying three years, individuals maturity is supposed to take a final shape and with this maturity they can easily cope-up with the non-traditional methods imposed by the teacher concerned.

Step 2 :

The sub-steps for implementing this step are :

a) The teacher concerned should think within himself what can be the modification of an experiment done in a traditional methhod.

b) While demonstrating a particular experiment before the students, the teacher concerned may ask the boys what can be the possible modifications in the experimental method.

c) Alongwith the answers of the boys, the teacher may give some outline ideas to the students for giving the joint ideas a final shape.

d) Arranging some additional classes the modified experimental method can be demonstrated by the teacher or can be exercised by the students, if time prmits.

4. CASE STUDY :

The experiment "Study on unbalanced operation of three-phase Induction Motor" has been exercised by the students in traditional and modified methods described below.

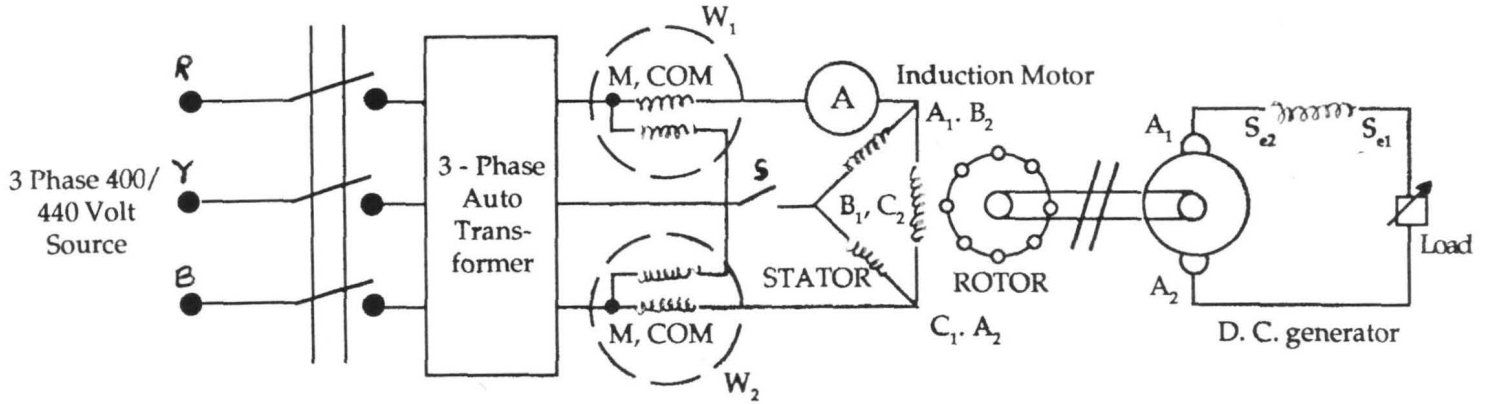

Fig. 1 - Circuit Diagram for conventional method of the exeriment,
"Study on unbalanced operation of 3-phase Induction Motor"

Traditional method :

Fig.1 describes the conventional method of the said expperiment. The set comprises of a squirrel-cage induction motor mechanically coupled with a D.C. series generator. For ease of performing the experiment, the extreme case of unbalanced operation i. e., single phasing operation has been experimentally performed by the usual way of connecting a single pole single throw switch ('S') in series with any one of the phases of the input to the motor.

Modified Method :

The sub-steps of this method are :

(a) Referring to Fig.-1, keeping switch 'S' closed, the induction motor is allowed to run on no-load only to see the direction of rotation.

(b) Keeping Induction Motor unexcited, the D. C. machine may be allowed to run in the motor mode on no-load and the direction of rotation may be noted.

(c) Keeping switch 'S' closed, the induction motor is allowed to run on no-load and simultaneously instead of loading the D.C. generator, the D.C.machine is fed from D.C. source. The direction found in a) and b) should be opposite.

(d) When the speed of the set is dropped to a required value, the switch 'S' is made open and the unbalanced operation starts.

Step 3 :

Now-a-days a tendency in the engineering college laboratories has been observed that the black-box type instruments or machines are being purchased to modernise the laboratories and it has been also simultaneouly observed that the permission from the institutional authority for purchasing these type of equipment is easily being obtained because the Government, now-a-days, sanctions a good amount of monetary grant to the Institute under the head "Modernisation of Laboratories". But a deeper insight into the matter can clearly show that the black-box type equipment have only the working terminals brought out and as a consequence the students can perform experiment on this equipment but after doing the whole expriment they are not in a position to know even what are the basic components inside the equipment. Our expectations from the students are not that only they will be able to perform the experiment in comparatively less time rather they should be able to develop a model of an engineering system from their fundamental ideas about the concerned area of knowledge. The following case study will give a clear idea.

5. CASE STUDY :

For measuring the starting torque of a three phase Induction Motor, there are various types of "torque transducers" available in the market. Though the use of transducers will enhance the knowledge of the students but initially, before the use of transducers, a simple mechanism of measurement of starting torque can be developed and the experimental method can be demonstrated by the teacher concerned.

The proposed mechanism for measurement of starting torque, consists of a mechanical fixture made of iron as shown in Fig. 2. The iron fixture is mechanically coupled with the shaft of the motor with the help of inserting a rectangular piece made of iron (trade name 'key') in the key way. By manually holding the weighting balance, the force and hence the torque at the starting condition of the motor can be easily found.

6. CONCLUSION :

Some non-traditional steps for implementation in the laboratory courses have been discussed.

Case studies have been discussed in suitable contexts to have a deeper insight into the effects of the steps on the students' performance.

The authors believe that step number 2 will be most effective but for this it requires a good team work.

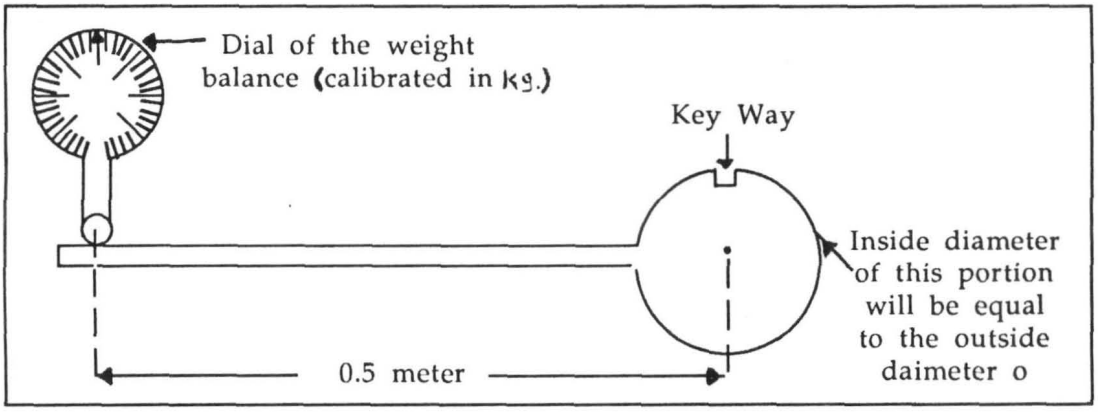

Fig.2 A simple mechanical fixture for measurement of starting torque of Induction Motor.

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