

# Research on the Construction of Enterprise case Resources in the course of principle and Application of Intelligent Electrical Appliances

Shilei Wang

Wenzhou Vocational & Technical College, Wenzhou, 325035, China

wangshilei8211@163.com

---

## Abstract

Resource library is an effective method for auxiliary teaching and learning, and the construction of enterprise case resources is a difficult point in the construction of curriculum teaching resources. The principle and Application of Intelligent Electrical Appliances is a new technology application course with strong practicality. Taking the supporting enterprise case resources of this course as an example, this paper introduces the construction method, path and follow-up construction idea of enterprise case resources.

## Keywords

Intelligent electrical apparatus, Configuration, Enterprise case, Resource library.

---

## 1. Introduction

The principle and Application of Intelligent Electrical Appliances is a new technology application course with strong practicality in electrical specialty. Through the study of this course, students can understand the latest research progress and development trend of intelligent electrical appliances, and master the professional knowledge of the concept, principle, method, technology and application of intelligent electrical appliances. The knowledge points and skills points of intelligent electrical appliances can be closely integrated into the specific project application, so as to provide direct and oriented help for students' graduation design, employment and so on. In order to help students master the knowledge and skills of this course quickly, a database of teaching resources has been built. The resource library is rich in material, including enterprise cases, short videos, virtual simulation and so on. In the process of the construction of the resource database, the cooperation between schools and enterprises is close, and the enterprises have integrated the actual engineering projects into the cases. The practicability and applicability of the resources such as the enterprise cases built are very strong. Students, teachers, business personnel and so on can get a lot of help in the case.

## 2. The method of Enterprise case Resource Construction

The so-called enterprise case is the actual teaching case of enterprise production, which has four characteristics. First, the enterprise case is to serve the teaching objectives, so it has the typical characteristics, and has a direct corresponding relationship with the corresponding theoretical knowledge. Second, the enterprise case also has a systematic reminder, the scope and content of the case should be able to cover the knowledge points and ability objectives of the teaching objectives, through the case can make it easier for learners to understand the teaching content. Third, the enterprise case also has the objective characteristic, the case must come from the actual production process, should be true and the technical level adapts to the teaching goal, can construct a systematic and comprehensive knowledge frame system for the learners. Fourth, the enterprise case should consider the problem of appropriateness. If the case is too difficult, the learners will lose their interest

in learning because of the lack of knowledge reserve. Therefore, the difficulty of the case should be moderate, there are the use of learners to learn to understand the problem, as soon as possible to master theoretical knowledge, improve practical ability.

Enterprise cases include source files, simulation animation, typical pictures, graphic descriptions, drawings and video and other contents. Due to the tight time limit and complex personnel in the process of engineering practice, enterprises can summarize and organize the following resources mainly by source files, typical pictures and graphic descriptions. Considering the efficiency of the cooperation between the classroom and the technical staff of the enterprise, it is suggested to integrate the enterprise case resources into rich material contents including project background, technical characteristics, typical pictures, source documents and so on.

In addition, due to the numerous types of resources in the construction of the resource base, attention should also be paid to the normative issues in the construction of enterprise cases. For text-type resources, such as doc, docx, PDF, and so on, there is no need to add a password, and PDF must have read and write permissions. For graphic resources, such as JPG, PNG, DWG, GIF, etc., the screen resolution should not be lower than 1024\*768.

### **3. Case Construction of typical Intelligent Electrical Appliance Application Enterprises**

#### **3.1 Case selection**

Considering that the overall goal of the course "principle and Application of Intelligent Electrical apparatus" is to require students to master the basic knowledge of typical intelligent low voltage electrical equipment, the application of configuration software, the construction of typical DCS control system and so on. The core of the course is to improve the overall quality of students and cultivate the abilities of students as the core, so that students can quickly adapt to the relevant jobs in the industry. Therefore, the selected enterprise cases will be closely related to the above objectives. In this course, the selected cases include \*\* waterworks electrical intelligent transformation project, \*\* airport air traffic control building electrical monitoring project, \*\* university intelligent electrical upgrading and transformation project, etc. Including water conservancy and hydropower industry, schools, enterprises and public institutions, etc., the intelligent application degree of electrical appliances of the project is high, and the typicality of cases is enough, so that learners are interested in understanding these cases.

#### **3.2 Introduction to the corresponding typical functions of Enterprise cases**

The knowledge objectives of the course "principle and Application of Intelligent Electrical Appliances" include mastering the functions and typical applications of intelligent electrical equipment, mastering the basic concepts of DCS, the basic flow of engineering implementation, and mastering the basic methods of FBD programming. Master the basic flow of typical DCS control system debugging. The typical function of the case must highlight the important knowledge points and skill points of the course. Therefore, the enterprise case should connect the important contents such as configuration control, FBD programming debugging, picture design and so on, so that learners can quickly combine these knowledge points with the actual case, so that it is easy to learn and master. For example, in the case of the \*\* university smart appliance upgrade project, The functions of the system include "picture configuration", "real-time monitoring of distribution equipment", "real-time data on-line monitoring", "timely feedback of fault information", "curve analysis" and so on.

"Real-time monitoring of the status of distribution equipment" can monitor the status of all equipment (opening, closing, fault) in the field distribution room in real time, and take care of each other through the cabinet diagram and the system diagram. It is convenient for operators to quickly find the location of the distribution cabinet that needs to be operated on the spot. As shown in Fig.1, this is a distribution room switch cabinet layout configuration screen, in which the operator can directly click to control the on-site switchgear and so on. "Real-time data on-line monitoring" includes on-line

monitoring of indoor temperature and humidity, three-phase voltage, three-phase current, active power, reactive power and apparent power in multi-function meter. The information data such as undervoltage protection, overload tripping, short-circuit tripping, three-phase unbalanced tripping and so on. Fig. 2 shows the upper computer control screen of a field Emax switch, in which the user can easily understand the actual working situation of the switchgear. Including its three-phase current, switching operation times, tripping times and closing information and so on. The function of "curve analysis" can be used to select and query the real-time curve and historical curve of important parameters, grasp the real-time dynamics, and facilitate operators to understand the power consumption and historical fault information of the equipment in a certain time unit.



Fig. 1 Configuration screen of switch cabinet layout in distribution room

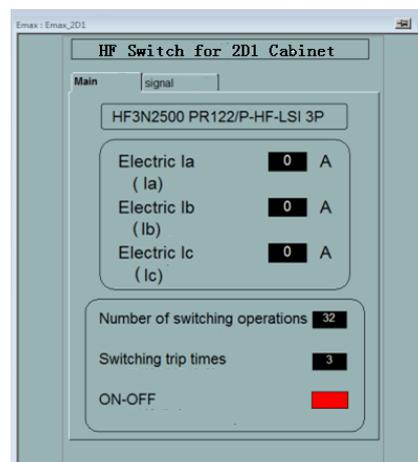


Fig. 2 Upper monitor screen of an Emax switch

### 3.3 New Technology of Electrical Appliances corresponding to Enterprise cases

The above cases are all controlled by the typical DCS control system, involving WinCS process station, operator station, system hardware configuration and engineering configuration, OPC communication, system debugging and maintenance and other important knowledge and skill points of intelligent electrical principles and applications course. Take \*\* university intelligent electrical appliance upgrading and transformation project as an example, the transformed intelligent electrical appliance application platform is connected by intelligent components with communication functions through digital communication and computer system network, realizing the automation and intelligence of equipment operation and management. The products involved in the case include intelligent plastic case, intelligent contactor, intelligent motor controller, soft kai, frequency converter, intelligent instrument, intelligent communicator and other related products. Through the study of this case, students, teachers and enterprise personnel can intuitively study and study the functional characteristics of intelligent low-voltage products and intelligent electrical communication

technology. Including: intelligent low-voltage electrical characteristics research, intelligent function test method research; Research on intelligent low-voltage electrical apparatus integration technology, intelligent functions of different low-voltage electrical apparatus are abandoned when various intelligent electrical appliances are integrated, and mutual coordination and cooperation are studied when multiple functions overlap; Research on typical solutions and overall solutions of intelligent network system; Research on test method of communication electrical apparatus, etc. Fig.3 summarizes the typical steps of school-enterprise cooperation to complete an enterprise case.

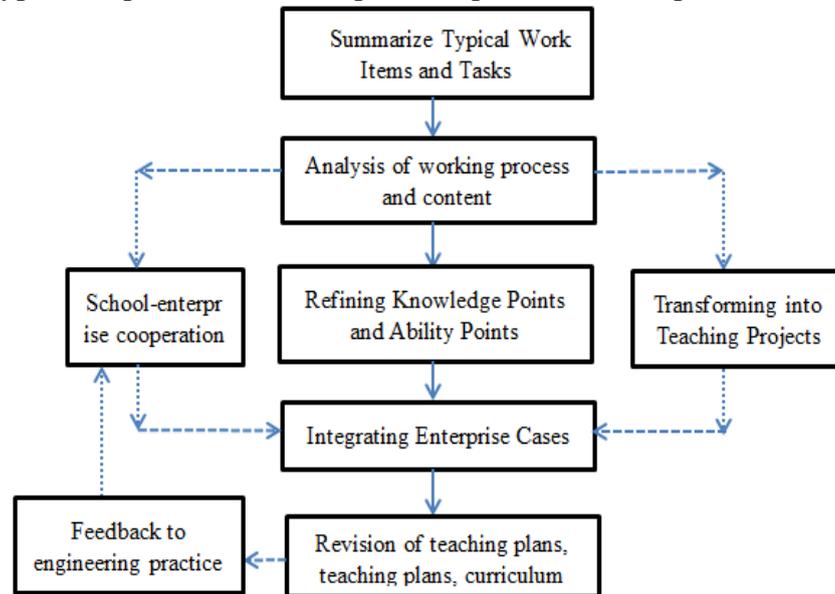


Fig. 3 Typical steps for schools and enterprises to complete a business case together

#### 4. Curriculum evaluation

The course "principle and Application of Intelligent Electrical Appliances" is taught according to the "Teaching Model based on working process", and various resources such as enterprise cases are used to assist teaching, so that the practical training is based on theory, and the theoretical part has been trained for the purpose. Let the two become one and rely on each other. The collection, collation, induction and summary of enterprise cases are not achieved overnight, but must be refined and summarized through the extraction and summary of real engineering projects on the basis of in-depth cooperation between schools and enterprises. In order to make the enterprise case applicable to the application of new electrical technology in the process of teaching practice.

At present, more than 10 enterprise cases have been collected for the course "principles and applications of Intelligent Electrical Appliances". In the future, we will consider introducing key videos of on-site operation and debugging into enterprise cases, so that learners can learn through these practical cases. Quickly master the debugging and application methods of intelligent electrical equipment based on typical DCS control system, and can be used in the follow-up graduation project, post practice and other links.

#### Acknowledgements

Project support: Wenzhou Vocational & Technical College "Thirteenth Five-Year" Education and Teaching Reform Project, the project number: WZYzd201715.

#### References

- [1] GAO Hui, YU Xiaohui, MENG Xianhai, et al. Design of Integrated Multi-Table Collection Based on Power Acquisition System. *Electrical & Energy Management Technology*. (2018) No. 21, p. 18-22.

- [2] Shilei Wang. Development and Application of Simulation Teaching Project of "Intelligent Electric apparatus principle and Application". Advances in Social Science, Education and Humanities Research. Qingdao, December 29-30, 2018, p.51-54.
- [3] Shilei Wang, Lingjiao Dong, Bimiao Wu. Intelligent electrical appliances and applications. Xidian University Press, 2019, p. 125-146.
- [4] Information on <https://new.abb.com/control-systems/zh/essential-automation-cn/wincs>
- [5] Information on <https://www.tech.net.cn/web/index.aspx>
- [6] Information on <https://www.icve.com.cn/>