

Study on the Effective Path of Disassembly and Assembly Practical Training of Chemical Pipeline

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ABSTRACT. As an important professional compulsory course for applied chemical technology majors, chemical pipeline disassembly and assembly is a basic skill that must be mastered for chemical engineering students. Through practical training, how to make students integrate the theoretical knowledge they have learned with chemical operation skills, and how to exercise and improve students' hands-on ability, analysis and problem-solving skills, and teamwork skills have always been the focus of the chemical pipeline disassembly and assembly training teaching. In order to improve the effectiveness of training and meet the requirements of vocational job capabilities, this article combines the actual needs of chemical jobs and takes a series of measures to carry out chemical pipeline disassembly and assembly training. The purpose is to improve students' comprehensive ability and cultivate students' good professional quality at the same time, which lays a solid foundation for students to engage in relevant technical work after employment.

KEYWORDS: Chemical pipeline disassembly and assembly; Practical training; Teaching method

1. Introduction

Higher vocational education plays an important role in cultivating high-skilled talents for production, construction, service and management. The National Vocational Education Reform Implementation Plan puts forward: "Requirements for the connection of professional settings and industry needs, the connection of curriculum content with professional standards, and the connection between the teaching process and the production process" (referred to as "three connections"). The "three connections" are the fundamental guarantee for the quality of vocational education in our country. The teaching process and production process emphasize the importance of the combination of work and study and the practical ability of students. At present, with the rapid development of vocational education, the reform of education and teaching is becoming more and more vigorous, especially in terms of increasing curriculum construction and enhancing students' vocational ability [1], which is the main task of teaching reform in higher vocational colleges.

At present, most vocational students have a weak learning foundation, insufficient learning initiative and self-discipline, unclear learning goals, poor self-discipline ability, and lack of subjective enthusiasm and teamwork spirit in the training process. According to the investigation in the practice teaching of chemical pipeline disassembly and assembly, many students lack good study habits and have weak hands-on ability. At the moment, many companies' feedback on the employment of vocational graduates shows that companies have higher requirements for vocational graduates. The specific requirements are: strong learning ability and good study habits; a solid professional foundation and excellent skills basic operating skills; have a good working attitude and teamwork spirit [2].

One of the goals of higher vocational education talent training is to focus on students' practical and innovative ability[3]. Chemical pipeline disassembly and assembly technology is an important professional ability for students majoring in applied chemical technology. With the rapid development of modern science and technology, most companies have increasingly higher requirements for the knowledge and skills of various professional positions in the chemical industry [3]. Therefore, practical training is to cultivate students' ability to think independently, operate independently, and apply theoretical knowledge to solve practical problems. It is a teaching link that cannot be ignored in cultivating applied talents.

Based on the above situation, this article introduces the task-driven teaching method and the concept of "6S" (SEIRI, SEITO, SEISO, SETKETSU, SHITSUKE, SAFETY) into the chemical pipeline disassembly and assembly training teaching, the purpose is to improve students' practical ability through training. Achieve

practical training effects, regulate the behavior and habits of the students, and cultivate to meet the requirements of enterprise employment.

2. The purpose of the chemical pipeline assembly and disassembly training

Based on the needs of speciality and professional positions, "Chemical Pipeline Disassembly and Assembly Training" is a highly comprehensive and practical course that closely combines theory and practice. The teaching purpose of chemical pipeline disassembly and assembly training is to enable students to master the basic knowledge of chemical pipelines through the training, learn chemical pipeline process flow chart drawing, installation and disassembly, operation and maintenance, fault detection, common fault analysis and solution measures etc.; through practical training, students can establish the safety awareness of chemical production; students can improve their abilities in drawing and map reading, disassembly and assembly of fluid conveying machinery, disassembly and assembly of chemical valves and instruments, and the operation skills of disassembly and assembly of chemical pipeline systems ; establish a rigorous work attitude, sense of responsibility, teamwork spirit, improve their ability to analyze and solve problems, cultivate hard-working qualities, and lay a solid foundation for students to engage in chemical engineering [4]. As a team, it can carry out pipeline assembly, pressure test, dismantling and replacement of some equipment. Carry out system trial operation and shutdown operation. It can independently solve the phenomenon of running, emitting, dripping, and leaking due to various reasons in actual work, as well as judging and handling common failures of commonly used instruments such as flow meters, thermometers, pressure gauges, and replacing the meters [5].

3. Task-driven teaching method implementation process

3.1 Task-driven teaching method

Task-driven teaching method is a teaching method based on constructivist learning theory. A very significant characteristics of task-driven teaching method is that it allows students to become the main body of learning, changing the traditional teaching mode of "teacher speaking and students listening", and creating a new type of teaching based on learning, student active participation, independent cooperation, exploration and innovation learning method [6-7]. It transforms the traditional teaching philosophy based on imparting knowledge into a multidimensional interactive teaching philosophy based on problem solving and task completion; it transforms recurring teaching into inquiry learning, so that students are in an active learning state. The student can propose solutions and solve problems based on their own understanding of the current problem, using shared knowledge and their own unique experience. The role of task-driven teaching mode is reflected in the following aspects [7]:

(1) It is helpful to cultivate students' interest in learning, and helps cultivate students to form clear learning goals.

(2) Contribute to improving students' knowledge structure system.

According to the tasks assigned by the teacher, students will consult relevant literature and complete the given tasks independently. Invisibly, students develop good independent study habits and expand students' knowledge. In the process of consulting materials and completing tasks, students expanded their knowledge and improved their knowledge system.

(3) It helps to improve students' comprehensive ability.

The traditional teaching model is that the teacher raises the problem first, then analyzes the problem, and solves the problem. Students can only adapt to the teacher's teaching mode, adopting passive knowledge transmission, lacking the initiative of learning, and unable to form the comprehensive capabilities of independent thinking, analyzing and solving problems. In the task-driven teaching model, students complete the entire learning process through tasks, organically combine theoretical learning and practical operations, and gradually develop and form the habit and ability to discover, analyze, and solve problems. At the same time, it is also conducive to cultivating students' sense of innovation and cooperation, and continuously improving students' comprehensive ability.

3.2 Implementation process

3.2.1 Basic requirements for students

(1) Preview before training

Students are required to do a good preparatory study before the experimental training, clarify the purpose, principle, requirements, disassembly and assembly steps, and precautions for disassembly and assembly of chemical pipelines, and understand the structure and working principle of the equipment and instruments used, and the types of disassembly tools and usage.

(2) Operation training in practical training

During the experiment, students should operate carefully, observe carefully, find problems, consider problems, cultivate their own rigorous scientific style in the experiment, and develop good study habits.

(3) Summary after training

After the training is completed, according to the training content, results and observed phenomena, analyze, carefully summarize, complete the training report, and submit the training report as required. The content of the training report includes: experiment purpose, experiment content, operation steps, precautions, etc. The experimental training report is the main aspect of the evaluation of the training results and should be taken seriously.

(4) Strict training group system

In order to achieve the training effect, the students in each class are divided into several groups, and the number of students in each training is 5-10, so that everyone can participate.

3.2.2 Task decomposition

(1) Student tasks and requirements

According to the learning characteristics of the students, the training content of chemical pipeline disassembly and assembly is subdivided into eight tasks, and students are required to carry out training work according to the assigned tasks, and finally conduct assessments. The specific task arrangements and requirements are shown in the Table 1 below. The assignment of tasks prevents students from feeling that there is nothing to do in the training, or that only some students participate in the training. Because of the many tasks, strict requirements and limited time allow students to have a sense of urgency in learning and learn actively. The specific tasks of chemical pipeline disassembly and assembly training, combined with professional job requirements, are broken down as shown in Table 1:

Table 1 Decomposition table of chemical pipeline disassembly and assembly training tasks

Task number	Task name	Task requirements
Task 1	Draw process flow chart of chemical pipeline	Check the literature and combine the chemical pipeline site map to complete the chemical pipeline process flow chart within the specified time
Task 2	Understanding of typical equipment and parts of centrifugal pumps, valves, flanges and pipe fittings	Check the literature, sort out and classify typical equipment and parts of centrifugal pumps, valves, flanges, pipe fittings types, functions, structural features, common faults and application scope, and submit them in electronic format
Task 3	Understanding and use of chemical pipeline disassembly tools	Check the literature, sort out the types, functions and uses, specifications and models, usage methods of chemical pipeline disassembly tools, and submit them in electronic format
Task 4	Specific steps/operating procedures for disassembly and assembly of chemical pipelines	Check the literature, summarize the sequence of chemical pipeline disassembly and assembly and precautions, and submit it in electronic form

Task 5	Chemical pipeline disassembly	Conducted in groups, combined with the specific steps/operating procedures of chemical pipeline disassembly and disassembly and required safe operations, and recorded on-site disassembly video and submitted it
Task 6	Chemical pipeline installation	Conducted in groups, combined with the specific steps of chemical pipeline disassembly and assembly to carry out disassembly/operation procedures and require safe operation, and record on-site disassembly video and submit it
Task 7	Leak test and pressure test of chemical pipeline	Work in groups, follow the operating procedures for pressure testing and leak testing, and record on-site disassembly videos and submit them, and can handle various faults during operation
Task 8	Summary of the training report	Complete the training report and submit it within the specified time

Pipeline disassembly and assembly are team operations, and the quality of team collaboration directly affects the quality and speed of assembly and assembly. Each member should have a clear division of labor and collaborate with each other. At present, most students lack subjective enthusiasm and sense of teamwork. In response to this situation, in the training process, students should be directly involved and actively participate, while at the same time, improve team cohesion and cultivate students' sense of collaboration and team spirit [8], meet the requirements of modern enterprises for employees.

3.2.3 Teacher guidance

In the process of completing tasks, students will inevitably have various problems. In order to help students solve the problems encountered in the process of training, the role of teachers is very important. Guide and rectify the problems that students have in the process of learning and completing the tasks, and really let students understand the relevant basic knowledge. In addition, the problems existing in the group training process of students, through video recording analysis, pointed out the incorrect problems in the operation process, and finally all problems are summarized and solved [9]. For example, the disassembly and assembly sequence is incorrect, the filter valve, the shut-off valve, etc. are reversed, the pipeline is inclined, the pipeline is shortened and finally cannot be installed, the gasket is misplaced, the pipeline leaks and can not find a solution, the tool is used incorrectly, and the operation is illegal (Do not wear labor protection supplies) and so on. The instrument is placed at will, the disassembly and assembly tools are also placed at will, and the opening and stopping operations of the centrifugal pump are wrong during the pressure test. Through the guidance of teachers, the hands-on ability and teamwork ability of the students have been improved, which laying a good foundation for future work.

4. Incorporate the "6S" management concept

In the current production of enterprises are based on 6S management to carry out production activities. Pipeline disassembly and assembly is a comprehensive training project [10]. In the course of disassembly and assembly of chemical pipeline, according to the requirements of professional position and referring to the "6S" management mode of enterprise, the specific training requirements are formulated, and the students are allowed to complete the training and assessment of disassembly and assembly of chemical pipeline according to the 6S management requirements.

The disassembly and assembly training of chemical pipeline is an important training course for chemical engineering majors. Through the disassembly and assembly training of chemical pipeline, the practical ability of the students can be trained, their problem-solving ability can be improved, and their professional quality can be cultivated, it will lay a good foundation for the related technical work in the future. The purpose of combining the teaching of disassembly and assembly of chemical pipeline with the management mode of factory is to let students know more about the actual management mode of factory, so as to prepare for adapting to and accepting the management of factory in advance, to some extent, it shortens the adaptation period after students' employment[2]. "6S" management, as an effective management method, is of great significance and necessity to be applied to the students' practical training courses. Therefore, the "6S" management concept should be

integrated into the practical teaching of the disassembly and assembly of chemical pipeline, the comprehensive professional quality of students has been improved, and the teaching effect of chemical disassembly and assembly has been enhanced. Students' study habits and behavior can be standardized to train students more in line with the requirements of enterprises.

5. Course assessment

5.1 Diversified course evaluation

The traditional course evaluation mode of this course is a final exam combined with usual attendance and classroom performance. For this course with higher practical requirements, the traditional evaluation mode has limited inspection of students' actual engineering ability. In the teaching evaluation design of this course, on the one hand, it strengthens the diversification of evaluation subjects, that is, student self-evaluation, student mutual evaluation, and teacher evaluation. On the other hand, evaluation methods are flexible and diverse, such as training reports, literature review, drawing assignments, and attendance, etc., are all included in the scope of evaluation.

5.2 Strengthen the process assessment

According to the characteristics of this course, our assessment method is different from the assessment method of traditional courses. The emphasis is on strengthening the process assessment. The specific assessment measures are as follows:

Process assessment: It is mainly used to test the comprehensive application of knowledge and the mastery of skills in the learning process of students, and the ability of students to solve problems. It is mainly evaluated through the implementation of specific learning tasks. Specifically, the assessment and evaluation of students' attitudes, attendance rate and performance of offline learning and participation in projects, including usual results and training results. The usual results mainly check the initiative and correctness of classroom questions, discussion and answer, the consciousness of classroom discipline compliance, and class attendance; the training results mainly check the completion of homework and the participation in training. At the same time, assessment and evaluation will be carried out in terms of the summary of practical experience gained in the process of completing the project, the students' writing ability and team awareness.

(2) Assessment content and standards

Teaching evaluation is one of the indispensable link in the teaching process. After the completion of the project, the students can first conduct self-evaluation during the completion of the project. Then the students in this group will evaluate each other, combined with the process assessment content and standards (as shown in Table 2), and finally the teacher will give a reasonable scores to the students.

Table 2 Process assessment content and standards of chemical pipeline disassembly and assembly training

Project	Examination contents	Assessment standards	Points
Task 1	Draw process flow chart of chemical pipeline	The equipment pipe fittings are marked correctly, the process is reasonable, and the overall appearance is beautiful.	15
Task 2	Set up and draft operating procedures for disassembly and assembly of pipeline equipment	The operating procedures are in line with reality, and the disassembly and assembly procedures are reasonable and scientific.	15
Task 3	Grouping for pipeline disassembly and assembly operations	Strict organization, reasonable division of labor, standardized operation, orderly, high efficiency	30
Task 4	Perform inspection operations on the pipeline after the pipeline is disassembled	Complete the task within the specified time and pass the inspection after disassembly and assembly of the pipeline.	30

Task 5	Civilized operation and norms	The operation is civilized, the site is thoroughly cleaned, the tools are placed in an orderly manner, and safety is the first priority.	10
Total score			100

The assessment of the chemical pipeline disassembly and assembly training course focuses on process assessment, which aims to improve students' professional quality and comprehensive ability, so that students can develop good study habits and form self-management ability[11-12]. In the process assessment, it not only mobilizes students' interest in active participation, but also cultivates students to correctly evaluate their own and others' qualities, reflect on their own behavior when evaluating others, and comprehensively improve students' comprehensive quality.

6. Conclusion

The chemical pipeline disassembly and assembly training is an important professional compulsory course and professional core course. Through the training, students can master the basic knowledge of chemical pipelines, and learn the flow chart drawing, installation and disassembly, operation management, and faults of chemical pipeline systems, detection, analysis and troubleshooting, etc., to enable students to further understand the internal structure of various pipes and valves and the basic methods of disassembly and assembly, experience the disassembly and assembly process by hand, and cultivate the skills and techniques of disassembly, assembly and maintenance of chemical pipelines. The task-driven teaching method and the "6S" concept are integrated into the chemical pipeline disassembly and assembly practical training teaching, and also diversified assessment methods are adopted to strengthen the process assessment. Through the practical training to improve the students' practical ability, exercise and improve the basic skills of the students, standardize the learning habits of the students, improve the teamwork ability, and cultivate the good professional quality of the students, which has laid a solid foundation for the students to engage in technical work after employment.

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