A TENTATIVE STUDY ON
TECHNICAL-PROBLEMS-SOLVING-ORIENTED
TRAINING MODES OF CONTINUING EDUCATION FOR
PETROLEUM AND PETROL-CHEMICAL TECHNICAL
ENGINEERS

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Abstract: Continuing education for Technical Engineers should be focused on adaptability and applicability. This article discusses the technical problem-solving oriented three-phase methodology, which includes organizing study seminar; experts coaching; and reviewing back in enterprises, on the basis of more than one decade practice of senior engineers training course for Sinopec to combine the mission of technical problem-solving with the engineers’ continuing education and successful solve the detached situation between continuing education and enterprise production practice.

Key words: Technical Engineers Continuing Education A tentative study

Continuing education, as one importance path to improve professional technician’s innovative and integrated qualities, is a way to guarantee the implement of the strategies of “rejuvenating the country through science and education” and “strengthening the country through talents”, meanwhile the foundation to ensure the core competence of the petrol-chemical industry. According to requirements to the senior Technical Engineers from the developing strategies of petrochemical industry and technical problems facing the enterprise, Sinopec has developed hundreds of researching and learning courses to senior Technical Engineers and achieved efficiency and effectiveness.

Training mode of continuing education for senior Technical Engineers

Training mode:
The training mode includes three stages in time sequence. The first stage - the trainees preview and conclude the technical problems in the subsidiaries, and raise them out in order to do the centralized training and seminar. They will do self-study and preview the related topics according to the courses arrangement and then raise their difficulties met in production and researching. When trainees are enrolled, trainers will classify and sum up all the problems and documents so as to propose the discussing topics of certain technical difficulties to set down the training courses after further consulting with experts and trainees. And then full time study - when trainees begin their study and discussion, following the schedule of training courses. Trainers,
at the same time, choose typical enterprise to do the spot teaching based on trainees’ requirement. This period lasts eight weeks. Second stage - with those technical difficulties in mind, the trainers will go back to their enterprises to finish their academic reports on how to solve these difficulties in their own enterprise in about twelve months. In this period, the trainees will apply their knowledge learned at the first stage to finish the academic report under the experts’ supervision. The third stage is to testify the academic reports by gathering to do communicating and defense, and listen to the experts’ comments. If they pass the defense, they are qualified to graduation and bring back the problem-solving scheme. The third stage lasts one week. To sum up, the training will be finished in fifteen months, including sixty days’ full time study.

The training procedure

1. carry out the need analysis and choose the topic
   Do need analysis among different sections, like the administrative departments, affiliated enterprises, colleges, first-line engineers, internet, newspapers, journals, magazines, etc. to know the profession developing plans of the Sinopec Group and latest researching, the current technical situation and difficulties of the enterprises. The investigation will be carried out by using questionnaire and interview. The training topics will then be chosen after doing a comprehensive analysis of all the investigation results.

2. settle down the objectives and trainees of the program
   Trainers will carry out the research, including clarifying the relevancy between researching topics and production, the topic-concerned technical procedure, the covered knowledge, current researching situation, analyzing the trainees’ education background and technical level to settle down the objectives and trainees for this program.

3. set up the experts group and hold the pro-seminar
   Program trainers will invite the experienced experts and leaders to be the members of coaching group, in charge of testifying the training program, etc. After that, the directors will improve their training programs and course syllabus by absorbing the experts coaching group into it.

4. Invite instructors with regarding the experts coaching group as the basis.
   When invite the instructors, they should be qualified with “good theoretical foundation and rich experience in practical working”. Great attention should be paid to those first-class experts in petrol chemical industry.

5. Group the instructors to develop teaching materials
   The trainers should communicate with the instructors more frequently in order to decide what to teach and edit practical teaching materials, particularly choosing the content concerning about new knowledge, new theory and new technology.

6. Organize the teaching and strengthen the ties
   During the time of centralized instruction, the trainers should communicate with the instructors and trainees actively and quick respond to the teachers. In this way, the instructors can modify their teaching materials and approach to guarantee the
effects of the training. During the time of doing review back in their own enterprises, trainers should also keep frequently contact with the trainees in order to supervise their work on final dissertation and ensure the communication between the experts and trainees.

7. Teaching response and evaluation

Teaching response should focus on how to improve the training, and how to make the response efficient to all the Technical Engineers with considering the experts, company and industry together. Evaluation is the reflection of whether the training program is successful or not, which mainly focuses on whether the ability of those trainees are improved.

The analysis of the feature of the senior engineers training program

1. This program finds a good way to develop the enterprise and Technical Engineers at the same time.

The enterprise is a financial group with more focus on economic benefits, and engineers are the main roles in production and operation of an enterprise. Thus it is one of the most important criteria of the economic benefits and the technical level of the technician whether the technical difficulties are solved. The training should be technical difficulties-solved-oriented with considering not only the economic benefit of the enterprise and practical ability of those engineers during the period of solving the technical difficulties.

Those engineers are too busy in dealing with various daily businesses to get guidance from high level experts and to share professional knowledge and experience. What trainers need to do is to find the connection point between the continuing education of the Technical Engineers and the development of the enterprise—technical difficulties to build a platform, the senior professional technician training program, for the Technical Engineers.

2. This program has met the requirement of the knowledge economy time.

In order to carry out the senior Technical Engineers training program, under the call to let experienced experts to “teach, help and supervise" the younger generation, Sinopec Group set up a 19-professional experts group, with 4 to 6 members in each one.

We also absorb famous academicians, experts and a few foreign experts from domestic enterprises, scientific research institutes and institutions of higher learning to give lectures, hold the discussions, and supervise their project research report.

The formation of the comprehensive teaching staff is the result of organizing all the resource in and out of the petrol chemical industry, which is the effective carrier to transfer the direct and indirect experience to the processional engineers and build up a platform for the Technical Engineers to share the knowledge.

3. Guided by the law of "understanding - Practice - Recognition"

According to the dialectical materialism, understanding and practice are closely connected with each other. Practice is the orientation of understanding and the motivation of the development of understanding. Practice is the sole criterion of truth. Only when the understanding can meet the requirement of the practice can it be
valuable. Understanding is actually a dialectical and finite process from being shallow to deep, from one-side to comprehensive, and from low level to high level. During the period of the training to the senior Technical Engineers, we abandon the traditional instructive way of teaching to adapt more various and effective ways, such as Heuristic study, discussion and case study in order to give full play to the initiative and creativity of students and to inspire their independent thinking and sense of innovation. In this way, the students' accumulated practical knowledge are theorized to be the rational understanding, and then viewed back into practice. After finishing the process of theorization, trainees will apply this way into practice to solve the technical difficulties, which makes the invisible knowledge obvious.

4. Develop the targeted series of teaching materials
Training materials is one of the most important elements affecting the final result of the training program. The development of teaching materials becomes the critical issue in continuing education. When carrying out the senior Technical Engineers training program, we regard the development of teaching materials as one of the most important elements. The chief teaching materials are all designed according to the training objectives, most of which are the materials at home and abroad collected by the experts and live cases gathered from the first line. Those materials all have the feature of being practical, innovative and advanced, which is suitable to the continuing education to the Technical Engineers.

The achievement of the senior Technical Engineers training program
1. From the perspective of the Technical Engineers, this program explores a new way to the continuing education of Sinopec Group and plays as a model for the employees training in the enterprises.
This training mode is approved to be very effective by the practice. Under the guidance of the experts group, the oil refining senior engineers training program carried out a full research about the urgent issues in the field of equipments of petrol-chemical industry. Meanwhile, in order to follow the direction of the development of technology, we choose the problems of the hydrogen equipments which commonly exist in the oil refining factories and difficult to solve as the topic for this training program to solve. All the trainees think that this training program is fully prepared in advance and choose an appropriate topic. After training, all the trainees have deepened their knowledge, and improved their ability to handle practical issues.

The trainers of the third senior professional technician training for the oil exploration group and the second one for the oil exploitation have given a common response: taking part in this kind of training program made them achieve more than any other technology training program, and thus it is really a very effective training approach. Some of the trainees also have applied this kind of training concept into their training program of their own company. This has become their excellent guidance.

2. From the aspect of production management, this senior professional technician training program has played a guide role to the production management.

The FCC experts group in the third senior professional technician training program
of the catalytic racking process tries to sum up the essential part of the technical difficulties from the trainees from different companies and roll them into a list of the operating condition of the FCC equipments. Therefore, it provides a better solution to the specific problems and plays a guide role for the management of the whole condition.

3. In term of our enterprise, this program provides a group of experts who are able to solve the practical problems.

When the trainees go back to their work after training, they all try to convert their knowledge into the practical production and they can also correctly analyze the practical problems and solve them effectively, which facilitates the production of the enterprise.

One of the trainers of the first FCC training program, who is in charge of the new technology MAP, applied the advanced knowledge learned from the training program into the upgrading of the pipeline, and achieved a great technical innovation of FCC beyond the international level. The reduction of the FCC olefin improves the outcome of the quality of the oil.

4. At the aspect of the trainees, this program trained them to have the scientific ways of thinking, innovative ability, and good morality and established a network of the technology exchange.

The cornerstone of the continuing development of an enterprise is the innovative ability in technology, while the cornerstone of the innovation in technology is the innovative engineers. The innovative awareness of a technician is founded on the base of the comprehensive understanding of the knowledge and equipment of the professional field. Only then Innovation is based on the knowledge of how it works and why it works. This way of senior professional technician training program makes the trainers have a comprehensive profound understanding of their profession and be able to analyze from the superficial to the deep Mechanism and form a scientific way of thinking. During the process of production, they can not only solve problems appeared but also the ones they can find and predict in the production. This can, then, make the work more active and innovative.

Through training, a good connection is set up between trainees themselves, and the trainees and instructors. This senior professional technician training program has also set up a platform for the technical exchange.

The senior experts who give lessons have a high level of professional knowledge and dedicated teaching spirit. With their strict character in science, all those first class personalities are a morality lesson to the trainees. The trainees can figure out easily the great gap between those experienced experts and themselves. The trainees of the hydrogen senior professional technician training program said in the forum for graduation that they are regarded themselves as the experts or chief engineers when they are in their own companies. However, compared with those senior experienced experts, they are just too shallow to understanding the real technology. They should regard the senior experienced experts as their models to motivate them to work harder and harder to make more contribution to our petrol chemical enterprises. When mentioning the relationship between their own achievement and the supervising of the
The practical influence of this senior professional technician training program

We can generalize shared stuff for the enterprises’ senior technician training program to learn from, which is the combined result from continuing education and practical production and follows the practical meaning of the petroleum and petrol-chemical senior technician training program.

1. share the experiences and lessons

Every learner should be a successful man and every successful man have his own experience of how to succeed and his lessons learned from the failure. The learners are the trainers and at the same time the carriers of the training resource. We should make full use of those materials and to reach the final goal that all the resource can be shared among trainers.

2. learn actively and initially

the training experience of the trainers are the important resource for the training activity and the technical difficulties are the main carriers of the learning in the process of research, so the trainers should have the attitude of being active in the whole process of the training. The trainers will actively choose the learning method and content, meanwhile learn the related knowledge of the topic, get a general view about the development of these unsolved technical difficulties. They also try to realize the teaching individualization in the group activities.

3. regard the practical ability as the key issue

As a kind of education event, training should also have three-phrases training objectives: knowledge, attitude and competent. The continuing education should focus on the improvement of competence and the changing of their backward concepts. The objectives of the technical training should be put on the combination of knowledge and competence and pay more attention to the competence of solving the practical problems. During the process of writing research report, especially connected with the researching topics of those experts and supervised by them, the Manipulative ability can also get a great improvement.

4. focus on increasing posts capacity

The majority of the trainees have their own position, some are perfect for themselves. They have a clear purpose in learning and their purpose is to apply them directly into their practical work. The trainees who are in the same training program almost have the same kind of background and purposes. When organizing the senior technician training program, the trainers will take all these common things into consideration to design the whole program, which can consider the difference between individual and group, at the same time fully address the relationship between
the related position and work.

This kind of Technical-Problems-Solving-Oriented Training Mode is oriented by the most advanced training theories in modern society. It is a special training program with the common feature of continuing education and the specialty of enterprise education, based on the analysis of the main features of the adult learning. With the improvement of the cognitive abilities, especially their innovative ability and potentiality as the end result, this senior professional technician training program is a new way to carry out the continuing education which makes further exploration in the fields of “instructing ”-cored teaching design and “learning” cored researching and discussion learning method. It is supported by the issue that this program will help the enterprise find ways to solve the technical difficulties. It is a way to find the support from the enterprise and thus fully accepted and welcome by the senior engineers.

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