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DOY713



United Nations Industrial Development Organization

Distr.  
LIMITED

1973G.146/26  
27 March 1973

ORIGINAL: ENGLISH

Third Interregional Symposium  
on the Iron and Steel Industry  
Brasilia, Brazil, 14 - 21 October 1973

Agenda item 9

THE ACTIVITY OF CESSID<sup>1/</sup>

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id.73-2047

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## SUMMARY

This paper deals with the activities of CESSID during the last 24 years.

It contains data on the methods of education of engineers in France and the policy of their utilization by the French iron and steel industry. It also contains details of the experience gathered during the three periods of CESSID's activities :

First period : The engineers attended a full-time 12-months session. The education was general in character and gave the engineers the possibility of adapting easily to different techniques. However, a 12-months period was considered by many employers to be too long. Moreover, the method was not adaptable to continuous updating of knowledge.

Second period : A main session of nine months, supplemented by short "seminars". Possibility of attending short sections of the main session.

Third period : Courses limited to two or three months, divided into short sections. Possibility of attending sections separately.

The participation of developing countries in this programme is detailed. The paper contains some recommendations based on the experience gained.

The "Centre d'Etudes Supérieures de la Sidérurgie" (Centre of Superior Studies of the Iron and Steel Industry) or short "CESSID", was created in 1949 and the session which closes in June 1973 covers 24 years of activities designed to improve the technical knowledge and skill of the superior technical staff (called "Technicians" in France) in the Iron and Steel Industry.

During this period "CESSID" had to modify its training methods in order to comply with the development of the technical and scientific knowledge and the demand for "permanent training". Thus it gathered great experience which will be dealt with further in this paper.

From the beginning, "CESSID" was administratively attached to IRSIL (Research Institute of the French Iron and Steel Industry) and many lectures were given by staff members of this Institute. This contribution is growing steadily as metallurgical processes acquire sound theoretical bases.

### The education of engineers in France and their utilization in the Iron and Steel Industry.

In France, among the many engineering schools that exist, a wide range in orientation and curriculum is maintained; often new programmes are instituted, thus creating diversity in the technical knowledge of the students.

However, most of these schools have a common characteristic. They do not dispense a specialised knowledge like most Engineering Schools and Universities in other countries.

It is believed that this specialization should occur later, through the professional practice on the part of the engineer. Thus none of the French engineering schools is specialized in metallurgy, even though some of them devote a large part of their curriculum to this particular field.

The technical staff of the French Iron and Steel Industry is recruited from various schools. In 1971 this industry employed 3 200 engineers, 2 817 of which graduated from 52 different schools and enrolled 319 graduates from 33 different schools.

As mentioned above, technical education in France is based on the principle that specialization occurs through professional practice. This principle is not strictly respected in the French Iron and Steel Industry. In fact French Iron and Steel technical executives change frequently their specialty, and an executive who would devote all his activity to one field would not further his professional career.

French Iron and Steel engineers understand and know that promotion is easier if they are interested in different branches and frequently apply for a change in specialty.

All these facts make it easier to understand the problems "CESSID" faces in the training of engineers and the methods and organization it has chosen.

#### The first period of "CESSID's" activities (1949 to 1962)

During this time period, the aims of the training can be characterized as follows :

- 1 - Acceleration of practical training and an effort to give it a more general character : an engineer acquiring all of his technical knowledge in the same plant may tend to limit his views to the techniques immediately available to him, and a lack of new experiences will soon give way to routine.
- 2 - Completion of the theoretical background necessary to metallurgical engineers : in the fields of chemical thermodynamics, physical chemistry of solutions, physical and chemical properties of slag, and a complementary training in the physical metallurgy of iron and steel.

3 - An effort to give this training a general character in order to enable the engineers to adapt readily to new techniques and processes.

The training period was extended to one year (12 months) at full time. During this period the students drew complete salary from their employers.

The students heard lectures (about 500 hours per session), had practical exercises in metallography, mechanical testing and heat treating, visited plants (about 35 visits per session), had two periods of practice of two weeks each in French plants, and a similar period of one month in a foreign plant.

The lectures were given by about 160 different lecturers, recruited from universities, research institutes, research and development departments, and other services of steel plants.

The program dealt with the three main manufacturing Departments (Blast Furnaces, Melting Shops and Rolling Mills).

The 1956/57 session dealt with maintenance and energy Departments. This type of session took place again in 1961/62, 1964/65, 1967/68 and 1971/72.

Results

This training gave the engineers the possibility to adapt easily to different specialties or different techniques in a given field.

The field trips gave the students a general view of the French iron and steel industry, and the large number of lectures enabled them to profit from a large amount of technical information.

Through practical exercises (about 90 hours per session) in the metallurgical laboratory, the students became familiar with current methods of investigation and their use in the assessment of metallurgical structures.

The engineers in charge of these classes had to formulate their ideas and use, in the preparation of their lectures, a vast amount of technical material. "CESSID" was, in this way, paying a valuable service to its industry. A number of these lectures were published as "CAHIERS DU CESSID".

However, this training method had several drawbacks :

- 1 - One year spent in "CESSID" was considered too long by numerous employers. In order to profit from this type of training, ideally an engineer should have 2 to 3 years of prior on-the-job experience. Unfortunately engineers having 5 or more years of experience find it impossible to leave their current position for a year-long program due to job responsibilities.
- 2 - The "CESSID" method became obsolete, as it appeared in the early 1960's that the need for a continuous updating of knowledge was the prime concern of most engineers ("formation permanente").

From 1949 to 1962 "CESSID" organized 13 sessions and received :

120 engineers from French Iron and Steel Companies

4 " " the French Railway Company (ENCF)

1 " " the Bridges and Roads Administration  
(Ponts et Chaussées)

1 professor from an Engineering School

20 engineers from Foreign Iron and Steel Companies, 14 of whom came from South America.

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total : 146

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This was insufficient in relation to the total number of engineers (more than 3000) employed in the French iron and steel industry.

The second period of "CESSID's" activities (1962-1969).

This period was marked by an effort to reach a larger audience and an attempt to improve methods in accordance to the new needs ("formation permanente").



The main session, whose merits were acknowledged by most students, was maintained ; its duration was, however, reduced from twelve to nine months.

It was complemented by several shorter (one week at the most) "seminars", each of them devoted to a different subject (burden preparation, blast furnace technology, converter melting shops, open hearth steelmaking, electric furnaces, rolling mills, etc...).

Thirty such "seminars", consisting of lectures, discussions and plant visits, took place during this time period.

Moreover, engineers who wanted to improve their understanding of a particular item were given the opportunity to attend a short part, i.e. one or several lectures, of the main session, spending, therefore, only a few days at "CESSID".

The session 1968/69 was organized to receive such auditors and its program was divided in chapters called "short cycles".

From 1962 to 1969 seven sessions were organized and "CESSID" received :

a) For the main sessions :

66 French engineers

33 Foreign engineers

9 Canadian engineers spent 3 months in our Center.

b) For the 30 "Seminars" :

1762 inscriptions with a total of 33 817 auditor-hours.

c) For the "short cycles" :

248 inscriptions with 5 113 auditor-hours.

(The main session consisted of about 800 hours of lectures, exercises and plant visits).

The "Seminars" and "short cycles" were attended by a large number of foreign engineers from Luxembourg, Belgium, and the German Federal Republic.

The third period of "CESSID" (1961-1969) - 1969

The difficulty of sending engineers to "CESSID" for periods as long as nine months, along with the need for a continuous updating of knowledge ("Formation permanente"), led the French Iron and Steel Industry to change its training methods, according to the following principles:

- a) Organization of courses limited to 2 or 3 months in duration, several courses forming a coherent session.
- b) The necessity to respect a balance between theoretical teaching and practical training.
- c) A more complete assimilation of theoretical and practical knowledge through an "active" training method consisting of lectures followed by discussions and exercises.

The organization of the lectures should allow the auditors to attend single lectures or chapters.

Three types of sessions were set up :

- 1) A session called "the making of iron and steel" including three courses, basic teaching (physical chemistry, thermodynamics, reaction kinetics, etc...), ironmaking (the burden and its preparation, theory and technology of the blast furnace) and steelmaking.
- 2) A session called "processing of steel" composed of three courses : physical metallurgy, rolling mills, and the utilization of steel.
- 3) A session called "General departments" consisting of several courses on maintenance, energy, water problems, etc...

### Results

The first three years period during which one session of each type was organized brought 814 inscriptions with 49 045 auditor-hours.

Three "Seminars" were organized in the same period and brought 123 inscriptions with 2 717 auditor-hours.

(Included in these numbers are the participations of :

- 39 engineers from Belgium with 1699 auditors-hours, and
- 111 engineers from Luxembourg 3191 auditor-hours).

The participation of developing countries.

Almost from the beginning of "CESSID's" activities the French iron and steel industry decided to foster the participation of engineers coming from developing countries. This policy was later supported through scholarships offered by the French Government.

From 1952 to 1972, "CESSID" received :

<b>From Brazil</b>	<b>27 engineers</b>
Argentina	7 "
Colombia	6 "
Mexico	4 "
Chile	3 "
Peru	3 "
Venezuela	2 "

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**South America: 52 engineers**

<b>Egypt</b>	<b>2 engineers</b>
Algeria	2 "
Tunisia	2 "
Turkey	1 "
Philippines	1 "
Poland	2 "
Spain	3 "
Portugal	1 "
Italy	10 "
Canada	9 "
Israel	1 "

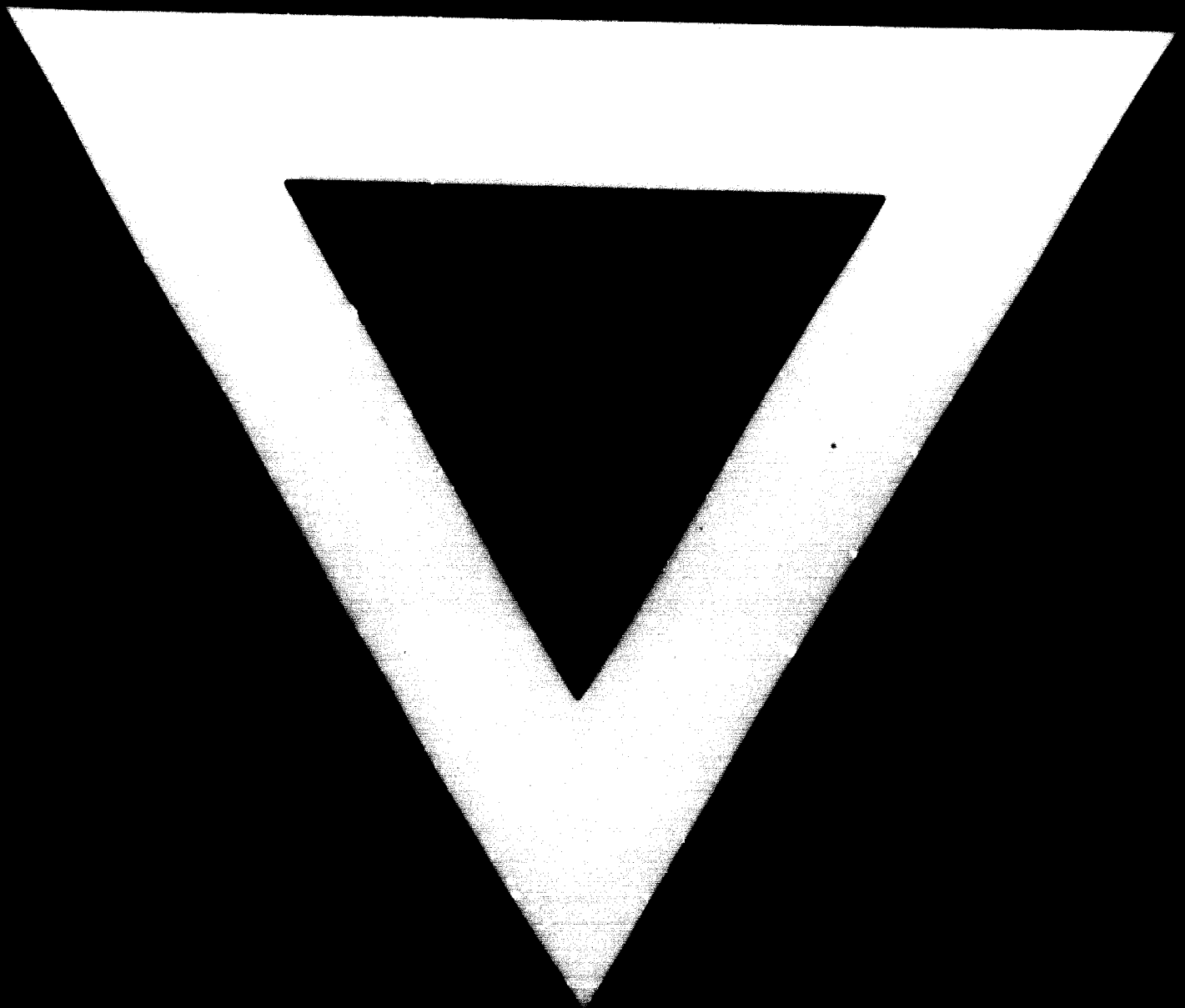
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**TOTAL 86 engineers**

### Conclusions and Recommendations:

On the basis of our experience of the changing needs of post-academic training, we would recommend the following :

- 1 - No course should exceed 2 or 3 months in duration ; the courses should be divided into well defined chapters that can be attended separately.
- 2 - A large number of such courses should be made available, a single course being too short to adequately cover an important topic.
- 3 - Trainees attending a course want the matter treated to be of direct use in their professional activities. Programs must, therefore, emphasize the practical applications of the theoretical material.
- 4 - The background of the lecturers should be diversified ; University members are in a better position to treat theoretical topics while members of research Institutes and Departments are more qualified to link metallurgical processes to their theoretical aspects. It is necessary to supplement this program with lectures given by plant engineers. These lectures should show the practical application of theoretical principles to manufacturing techniques and treat the most important technological problems.
- 5 - It is important that the text of all the lectures should be available in advance to familiarize the students with the material to be covered. These texts will provide a useful up-to-date documentation for future reference.



**17.6.74**