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SOME ASPECTS OF THE RATIONALIZATION PROCESS IN THE CHILEAN  
METALLURGICAL INDUSTRY

contributed by

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METALLURGICAL INDUSTRY

by Vicente A. Sota Barros

1. General Background Data

a) Purpose of this report

Some experiments and rationalization projects - aimed at increasing productivity - in connexion with the Chilean steel-making and metallurgical industries will be described in the present report. A review will be made of achievements to date and of the projects which - following the lines laid down by more economically developed countries - are to be executed. The report follows the sequence of events and ideas which occurred in the Chilean case.

b) Brief comments on the Servicio de Cooperación Técnica Industrial

The organization was created by virtue of an agreement signed by the Corporación de Fomento de la Producción and the Institute of Inter-American Affairs, a United States agency, on 30 June 1952. According to this Agreement, the Servicio aims at "helping national concerns through the introduction of more efficient management techniques."

Assistance comprises:

1. A group of experts sent to Chile by the Institute of Inter-American Affairs to collaborate in the implementation of an assistance programme for small and medium industries.

2. Activities connected with industrial productivity, such as:

a) Production planning and control, including studies on flows and channelling of materials in industrial plants, cost accounting, industrial organization, volume and quality control for production, internal lay-out of industrial plants, methods engineering, handling of materials and related activities.

b) Personnel standards including classification according to merit and evaluation of work, incorporation, selection and training of personnel, industrial training, wage payment systems and connected activities.

c) Special projects, including use of energy and fuels, design of industrial buildings and connected activities.

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If the technical assistance programmes designed mainly for small and medium industries should prove helpful in increasing the productivity of larger industrial plants, selected plants of this kind might be included in the programme so that the greatest benefits might accrue to the Chilean economy.

For a clearer understanding of what follows it seems advisable to refer to the two bodies which are working in Chile in the field of implementation and extension of scientific management principles, namely the Servicio de Cooperación Técnica Industrial (S.C.T.I.) and the Instituto Chileno de Administración Racional de Empresas (ICARE).

The Servicio de Cooperación Técnica Industrial comprises three main departments: Industrial Engineering, with a subsidiary section on Costs and Productivity; Industrial Relationships and Extension.

About 40 Chilean engineers and technicians and some United States consultants collaborate in the work of the Servicio. They have mainly worked in the metallurgical industry, mining, textiles and ready-made clothing. Section 2, b describes the assistance rendered to the first-named, which is the most interesting in connexion with this study.

Although this co-operative programme was initially scheduled to end by 1955, the contracting parties have extended its duration until 1960.

c) Instituto Chileno de Administración Racional de Empresas (ICARE)

The charter of this private corporation, established in 1953, defines its objectives as follows: to disseminate the methods and principles of rational management of enterprises and scientific work organization, through the planned utilization of the human and material resources required for production. Its main activities therefore consist of solving the administrative, economic and human problems of industry, in collaboration with public authorities, entrepreneurs and workers.

Its members include executives of industrial, business, mining and agricultural concerns, either private, para-statal or public; professionals, teachers and students and, in general, all persons interested in this subject. Both Corporations like the metallurgical industries, and individuals are members of the Institute.

ICARE performs its work through the following divisions and committees: Production and Manufacture; Market and Sales Studies; Financial and Cost Control; Personnel Relations; Public Relations, University Activities; Extension and Research.

Exchange of information and experience among its members and particularly with foreign experts, takes place through meetings, seminars, publications and visits.

Unlike the Servicio de Cooperación Técnica Industrial, its activities are mainly informative in character and have developed in close contact with the higher echelons of management.

It has recently organized a very successful Management Seminar, an advanced one-month course attended by 44 entrepreneurs.

It is affiliated to the International Committee of l'Organisation Scientifique (P.A.C./C.I.O.S.), the first Pan-American congress of which it is at present organizing, by inter-connecting the various international co-operation organizations. The Instituto has received technical aid from the corresponding organizations of the United Nations and the United States.

Its board of directors has planned the creation of a National Productivity Committee and an Experimental Productivity Committee for the Metallurgical Industry. (See Section 3,a.)

Likewise its Seminars on Planning and Production Control are attended by most of the higher executives of the metallurgical industries undergoing the rationalization plans mentioned in section 2,b.

## 2. Some aspects of rationalization in the Chilean Metallurgical Industry

Rationalization implies the implementation of modern industrial engineering techniques for the better utilization of all production factors - labour and capital goods - in order to raise yields. In other words, it is a question of using scientific management practices to raise productivity.

This section will deal separately with some highly significant experiences obtained in the Compañía de Acero del Pacífico (CAP) in Huachipato and in various metallurgical processing installations.

This individual analysis is justified not only by the differences between the activities of CAP and other companies, but because different /procedures have

procedures have also been applied. Moreover, CAP has its own technical advisors and Industrial Engineering Department, while the other factories relied for these purposes on the Servicio de Cooperación Técnica Industrial.

Reference will be made only to the system of evaluating the work and time studies, together with their use to determine personnel requirements and payment of production bonuses.

The purpose of evaluation is to determine the relative importance of each post for the purpose of establishing a proportional pay scale. This promotes equity in remunerations and provides a sufficiently objective criterion for the establishment of a system of grades or steps so that the staff members may know their present position within the company and their prospects for promotion.

Careful time studies, carried out by specialized personnel, may lead to the determination of the time required to perform an operation under normal conditions and thus a bonus may be paid for extraordinary performance.

In this way it is possible to determine personnel requirements for each operation as well as the bonus to be paid for those who exceed the production standard.

Other industrial engineering techniques which mainly affect mechanical characteristics have not been taken into account.

It seems reasonable that the creation of an equitable wage level constitutes one of the aspirations of industrial workers. Since evaluation and the bonus system tend towards this goal, such methods tend to create satisfactory working conditions which undoubtedly redound to the benefit of yields.

a) Compañía de Acero del Pacífico (CAP)

i) Evaluation of the work. In September 1954, after more than a year's work, the management of the Company announced that the description of the jobs executed by its labour force had been finished. This description was made by the members of its own Industrial Engineering Department and included the following factors: main duties of the job, working methods, education and manual skill requirements, physical effort required, materials, tools and equipment used, supervisory responsibility

/over other

over other workers or equipment and materials and risks involved in the work, environment and security conditions.

When the description was finished, the management invited the representatives of the trade union to meet with the Evaluation Committee in order to calculate the points to be credited to each job and to determine the corresponding grading system. The Committee prepared a grading system for all posts and after successive negotiations with the management, a Permanent Agreement on Work Evaluation was concluded.

In brief, the Agreement provides for the creation of an Evaluation Committee in which workers and the management would have equal representation, to evaluate new jobs and reassess those which are modified as to their content. Likewise a procedure for appealing was set up in connexion with the classification of posts and the evaluation of jobs.

ii) Time studies. Upon this delicate question, which involves controls that may set up psychological resistance when their bases and aims are not clearly defined, agreement has been reached by the Management and personnel after lengthy negotiations.

The Ministry of Labour was requested to intervene in the matter, and this organization set up a commission comprising an official representative and two representatives for each contracting party.

The Commission drafted a document on "General Bases for Time Studies and their Application to a Bonus System". Its main points are as follows:

- a) The Company's objectives in connexion with the rationalization technique.
- b) General principles and definitions used in time studies.
- c) Measurement of work through time studies.
- d) Procedure for setting up the bonuses.
- e) Establishment of a permanent Committee of Appeal.
- f) Procedure for personnel transfers when time studies prove that over-staffing exists.

b) Other industries

Several industrial engineering plans have been implemented in an important factory manufacturing bicycles and other metallic products.

An adequate training of supervisors and the establishment of a sound planning and control systems for production have enabled a monthly increase of 20 per cent to be obtained in the production of bicycles.

In a glazed-iron ware factory, production planning and controls have also been introduced, together with a job evaluation and bonus system. In the "crude" shop, labour productivity improved by 29 per cent, while costs declined by 23 per cent.

The organization system of an important industry manufacturing metallic structures, boilers and railway trucks has been established. On the basis of job descriptions, the company was reorganized particularly in order to develop a well-planned Production Department.

In an electric-welding factory, the following problems have been analysed: increase in production capacity, location of new machinery, bonus systems and production control.

The training of supervisors and study of new locations for shops and machinery were the main rationalization activities in an electro-metallurgical foundry and in a factory manufacturing floor polishers, electric fans and electric motors.

No data are on hand as to the improvement in yields due to the new methods, among other reasons because measurement of productivity and the use of the corresponding statistics are practically unknown in Chilean factories. In any case, the brief summary given above does indicate that a gradual rationalization process is under way, the effects of which will become more apparent when the country acquires the technical personnel capable of promoting this process and when managers and workers become aware of its value, not only for themselves as individuals, but for the community as a whole.

3. Proposed creation of an experimental productivity centre  
for the metallurgical industry

a) Activities of the Instituto Chileno de Administración Racional de  
Empresas (ICARE)

When ICARE recognized the need to apply the beneficial effects obtained from the specific projects described in Section 2,b on a national level

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and considering the opinion of those who had had occasion to see the European "Productivity Centres" at work, it was proposed to study the possibility of a similar project.

The corresponding report drafted by the Commission entrusted with this task is given below:

#### EXPERIMENTAL PRODUCTIVITY COMMITTEE

##### A. Definition of Productivity

1. Productivity, or yields, is defined as the relationship between the amount of products obtained and the effort put into obtaining them in a given period.
2. In a restricted sense one may speak of labour productivity, machinery productivity, investment productivity, land productivity, etc. according to whether the relationship is established between the amount of products obtained and total labour, machinery, capital, etc. used in production.
3. Even though the concepts of capital or land productivity may be very significant for certain purposes, the concept of labour productivity has been given most attention in recent years, so much so that if productivity alone is mentioned reference is usually made to the productivity of labour. In this case the unit of measurement is man-hours, or man-weeks, etc. required to produce a given amount of goods or services.

##### B. Rationale

4. Industrial progress is the salient feature of our times and for this reason the most developed countries have set up programmes for productivity planning and promotion.
5. Most European countries have established national productivity committees. Moreover, there is a European agency which co-ordinates the work of the member countries. All production factors (managers, technicians and workers) are represented in these production committees or centres. Most of them have been established by law and the State exerts a marked influence. According to information provided by the International Labour Organization, such agencies also exist in socialistic economies and, with their own characteristics, in Canada, United States and Mexico.
6. A Productivity Committee is particularly necessary in Chile at the present stage of industrial growth. Such an institution will not only contribute to the orderly development of industry and to the production of a greater volume of goods per inhabitant, but will

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also constitute the best means for offsetting the strong inflationary process affecting the country. (See Economic Commission for Latin America, Economic Survey of Latin America, 1954 (E/CN.12/AC.362/Rev. 1), New York.)

#### C. Purpose and area of influence

7. The aim is to establish an experimental productivity committee as the first step towards the creation of a national committee. This evidently requires that the proposed project should first acquire prestige in the field and that technical collaboration between managers and workers should be initiated. Needless to say, both objectives will be easier to attain if the project is limited to a single manufacturing activity.
8. It is suggested that such a project should be initiated in the metallurgical industry, taking advantage of the prestige, organization and progressive spirit of ASIMET, the existence of particularly favourable personnel relations in this industry and the present existence of rationalization plans in various member factories.
9. The objectives of the Productivity Committee for the Metallurgical Industry may be described as follows:
  - a) Information and extension activities connected with the concept of productivity. Creation of an awareness - at all levels of the metallurgical industry - as to the need and importance of raising production yields.
  - b) Study, promotion and execution of programmes for raising productivity as described below.
  - c) Guidance of productivity plans, with priorities and definition of the degree of technical feasibility of the projects which may arise for increasing productivity.
  - d) Co-ordination of all integrating elements as a result of the strictly technical collaboration among managers and workers, all this with the aid of the organizations which may contribute in the preparation of productivity plans.

#### D. Organization

10. The Productivity Committee for the Metallurgical Industry was planned as an autonomous entity sponsored by ICAFE and under the aegis of ASIMET, the trade unions of metallurgical workers and employees, the S.C.T.I. the universities and the engineers' and technicians' associations.

11. In order to facilitate the achievement of specific results in the least possible time, it was proposed that the Committee should be formed as follows:

8 representatives of management, appointed by ASIMET from among those who accept the general bases on which the Committee is to be established.

8 representatives of the workers in the same companies, appointed directly by the enterprises, and including:

4 representatives of workers

4 representatives of clerical staff

4 experts on rational management appointed by ICARE

Total 20

12. The Committee shall elect a director, whose name should not appear in the above list, but who should be an outsider with respect to the enterprises therein represented. However, a quorum of 4/5 of the members (16 votes) will be required for his election so that the director may have almost the complete backing of the Committee.
13. Apart from presiding over the meetings, the director shall distribute and co-ordinate the activities incumbent upon the commissions listed below, and the individuals or institutions which co-operate with the work of the Committee. Together with the secretaries of working groups and the secretary of the Committee he shall form the Executive Secretariat of the Committee.
14. In order that the Committee may have to hand the information required as to the most urgent matters which affect the improvement of productivity in the metallurgical industry, the work is to be organized in the following working groups:
- I - Information and extension
  - II - Survey of methods for measuring productivity
    - Productivity statistics in the metallurgical industry
  - III - Production, distribution and consumption (market study)
  - IV - State action
  - V - Standardization and studies on production methods

/VI - Technical

- VI - Technical training for workers and employees and education of supervisors
- VII - Socio-economic factors of productivity
  - a) Technological disemployment in relation to productivity plans for the metallurgical industry
  - b) Industrial and working relations in the enterprise.
- 15. Each working group shall appoint an executive secretary in charge of the permanent activities of the group. The Committee shall designate the members of each working group.

Each working group shall propose to the Committee the practical measures required to put its own recommendations into effect. The Committee should then decide on each proposal, taking into consideration that the promotion of productivity plans may be undertaken not only by the Executive Secretariat but by the subsidiary agencies of any of the various organizations represented in the Committee: departments of ICARE, ASIMET, S.C.T.I., faculties of economics, mathematics and physics of the universities, Instituto de Economía of the Universidad de Chile and the Universidad Católica, Instituto de Investigaciones Tecnológicas y Normalización, Comisiones de Trabajo de los Sindicatos Obreros and of the Federación de Empleados de Industria y Comercio, associations of engineers and technicians (Instituto de Ingenieros Químicos, Asociación de Ingenieros Industriales, OTECH, Instituto de Ingenieros de Chile, ASINCH, etc.)

- 16. Taking into account the lack of competent personnel to execute the work planned by the mentioned groups, the Committee will immediately establish priorities as to the most urgent questions which must be dealt with in relation to the metallurgical industry.
- 17. In order to fill the need for engineers and technicians, the Committee might adopt the following measures:
  - a) request the S.C.T.I. to give adequate training to the technical personnel at present working in the metallurgical industry (Mackenzie Plan).
  - b) Encourage engineers who have specialized in other fields to undertake industrial engineering jobs. They should be remunerated directly by the metallurgical industry affected and they might eventually receive a bonus out of the Committee's funds.

18. On the assumption that both managers and workers should participate in the formulation of plans for improving productivity and later in the implementation of such plans, the Committee should set up the following immediate targets for its organization:
- a) Creation of technical training courses for the representatives of workers who will belong to the Committee or are in any way related to the Committee's plans.
  - b) With the co-operation of the international technical assistance organizations operating in the country, teams of managers, workers and technicians might be sent on trips to those countries which have already established productivity plans similar to those favoured by the Committee.

It is to be understood that the Committee shall operate only in those industries which will accept the general indications contained herein and that ASIMET will make the corresponding survey.

#### E. Financing

20. The fundamental principle is that all the sectors represented in the Committee shall contribute financially. It is likely that, to begin with, ASIMET will have to bear the brunt of expenditure, since the workers' and employees' trade unions will have made no provision in their budgets for the quotas which the Committee may charge.
21. In order to utilize ASIMET's administrative facilities and technical personnel it is suggested that the Association in question should provide the executive secretaries of the working groups mentioned in paragraph 15.
22. Most of the remaining expenses for the Committee's work may be defrayed by the member institutions. This is particularly likely in view of the fact that such entities are already working in similar fields and that in many cases the work of the Committee will consist solely in co-ordinating such activities in the sphere of the metallurgical industry.
23. It is estimated, however, that the committee should have at its disposal a minimum fund for indispensable expenditure: director's fees, printed material, publications in newspapers, per diem for travel expenses to outlying areas, fees for work undertaken by outside persons, etc.

The initial fund is estimated at 3,500,000 pesos which will be contributed equally by the entrepreneurs and workers represented in the Committee if possible, with some subsidy from ICARE.

b) Activities of the Asociación de Industriales Metalúrgicos (ASIMET)

This trade Association has received the preceding project and has given it close consideration.

Conditions at the moment, however, have obliged ASIMET to deal with more pressing problems relating to the economic stabilization which the country is undergoing and therefore it has not been able to take more decided steps towards the organization of the Centre.

Nevertheless, as is noted in ICARE's memorandum, ASIMET has already assumed several of the responsibilities proposed for the experimental centre and this is a good indication of what can be done when the Association finally decides to put the proposal into effect.