NISST

Aims and Objectives

National Institute of Secondary Steel Technology

CONTENTS

AIMS & OBJECTIVES AND PROPOSED ACTIVITIES OF NATIONAL INSTITUTE OF SECONDARY STEEL TECHNOLOGY

1. BACKGROUND:

1.1 At the end of 50's and early 60's India went in a big way to produce steel by installation of three integrated steel plants. This gave a boost to the national economy and the rate of growth of the engineering industry was phenomenal in 1960's. However, steel production remained stagnant from the late 60's to early 70's and the country faced an acute shortage of steel. During this period it was thought that Electric Arc Furnace Steelmaking Process in the private sector may supplement the production of integrated steel plants to bridge the gap between supply and demand. A similar need was also felt in rolling mill sector. Subsequently these Electric Arc Furnace Steelmaking units and Rolling Mills became known as "mini steel plants" and "mini mills" respectively.

1.2 Though electric arc furnace steelmaking process was first introduced in the country more than 100 years back, sudden high rate of growth in EAF steelmaking took place during late 60's and early 70's. At present about 196 mini steel plants with a total capacity of 6.6 million tonnes per annum have been licensed. Out of these 163 units with a capacity of 4.64 million tonnes have already been commissioned. Similarly there are large number of rerolling units operating with an annual capacity of about 20 million tonnes.

1.3 It has been estimated that at the end of the century we will have a demand supply gap of about 5 to 6 million tonnes of crude steel even after considering the modernization and expansion programme of SAIL units and TISCO and commissioning of Vizag steel plant. It will be prudent if this production gap is made up through EAF route the units may be spread all over the country to meet the local market demand. Further several factors like affordable and comparatively lower capital

This was approved by the Board of Governors in the Board meeting held at New Delhi on 18-07-1988

cost compared to the integrated steel plants, lower gestation period, adaptability of production range due to easy controllable operational variables etc favour the development of EAF route for production of steel.

1.4 However, the performance of the electric arc furnace /rerolling industry in India is very unsatisfactory compared to that of other advanced countries. For this, there are various factors responsible, apart from technological obsolence. This industry is continuously suffering from input management like short supply of scrap, sponge iron, billet, power supply etc which are largely beyond the control of the industry.

1.5 It is expected that the Government will take an aggressive step to augment the supply of such scarce items like billets, scrap, sponge iron and power. The recent policy announcement made by the Government towards the expansion and modernization of EAF steel industry is the first step towards making the industry to stand on a solid footing.

1.6 This shows that the Government of India has recognized the potentiality of secondary steel producers for meeting the shortfall of demand not only on long products but flat products as well.

2. NEED FOR SETTING UP OF A NATIONAL INSTITUTE FOR SECONDARY STEEL INDUSTRY:

2.1 The trend of production in the international scenario indicated that the share of steel production by EAF route is increasing year after year, specially from the beginning of this decade, when the demand pattern of steel in the advanced countries witnessed a sea change. At present the share of EAF in total global production of steel is over 35%. It is stated by the International Iron & Steel Institute that by the end of this century, EAF may contribute over 45% of the total world steel production. So far as our country is concerned, at present the mini steel plant produce over 30% of the country's total steel production and by the end of this century, we may follow the trend indicated by the International Iron & Steel Institute. Therefore, it has become a great national challenge to make this industry more efficient so that steel is available at a reasonable price. This may be achieved only if our efficiency factors in producing steel come close to the international performance level. The performance gap in this industry is mainly due to adverse conversion cost, whether it is in the operation of EAF or processing the steel in the rolling/rerolling mills. The adverse efficiency factors are mainly due to high specific energy consumption in EAF as also in the reheating

furnaces, high specific consumption of electrodes, refractories and other inputs as also lower yield. Furthermore, the rate of production from producing units is also very low and waiting/downtime is high. The entrepreneurs are aware of these deficiencies. Even the Government is aware of the poor performance of mini steel plants/mini mills. Large number of comparative data of the performance of Indices of Indian mini steel plants/mills and abroad are available in various reports and seminar papers. We need not reproduce these data here. However, these differences are frustratingly large.

2.2 With a view to bridge these gaps in performance, a high power team "Indian Steel Mission to Europe" visited EEC countries steel industry under the leadership of Secretary (Steel), last year (1987).

2.3 Following are the observations of the visiting team:-

-"The interaction with the technical expert at the shop floor by way of training to encourage the technological discipline in Indian mini steel plants and to facilitate smooth transfer of technology. The Government of India will be too glad to set up an institutional arrangement with the assistance of EEC countries which can also act as a nodal agency for acquiring latest technological development taking place in European countries and to assist the Indian entrepreneurs" (Chapter II, Page 5).

-"In most of the plants it is found that the training of manpower is given very high priority" (Chapter V, Page 35).

-"A Training Institute may be set up in India with the assistance of EEC in which Government of India and Steel Furnace Association of India would be involved. The Institute would concentrate on courses leading to an efficient management of energy in mini steel plants and the ultimate objective would be to finally impart training to shop floor people so that mini steel industry in India achieve international production norm." (Chapter VI. Page 38).

-"In India, most of the rerollers are still operating inefficient mills where both productivity and the quality of a product are at very low level. Modernization of the rerolling sector of the Indian mini steel industry has to be taken up in right earnest". (Chapter V, Page 36).

2.4 Further, the Dec '86 international seminar on "Role of Mini Steel Plants – New Technologies and Challenges" organized by the Steel Furnace Association of India, supplied a large number of papers indicating the performance gap between Indian mini steel plants and those in the advanced countries and also suggested technology and modernization which may improve the performance of our mini steel industry.

2.4.1 Further, the paper submitted by Badische Stahlwerke A.G., West Germany in this Seminar stated as below:-

- "We think today that success of a company is predominantly based on its personnel.

When talking about investment, people normally think of machines and building. BSW have made successful investment in the field of personnel development. We think that the success of the company depends 80% on the people.

2.5 Therefore, it may be concluded that with the formation of NISST, the aspirations of mini steel plants/mills to have a nodal agency for Human Resource Development and Technology improvement has already been met.

2.6 It may not be out of place to mention here that "the technology is often sold in packages i.e. in turnkey projects but a serious question remains as to whether this is the most efficient way to transfer technological knowledge. It is often questionable whether all the knowledge required to operate steel plants successfully can actually be bought and sold. For all practical purposes it may be said that the ability to make effective use of knowledge cannot be transferred. This ability can only be acquired through indigenous technological mastery through human capital formation. "(Dr. G.Mukherjee's report to SAIL, 1986).

3. AIMS AND OBEJCTIVES:

3.1 The aims and objective of the Institute are summarised below:

3.1.1 Indepth study of the needs of the Secondary Steel Industry in the field of Human Resource Development and conducting Basic Training and Perfection Courses (e.g. Short-tem, Sandwich Refresher and Crash Courses etc) to enhance the skill of the personnel employed by different units.

3.1.2 Industry wise interaction in different areas of Secondary steel production (e.g. Raw materials, Electric Arc Steelmaking, Concast, Refractories, Rolling Mills, Energy Conservation, Pollution Control etc) through dialogue sessions, seminars, Operating Committees etc and building up of a data bank.

3.1.3 Extending Consultancy Services to the Secondary Steel Industry on various aspects of technology and associated matters e.g. quality improvement, technology selection and adoption, product diversification etc.

3.1.4 Promoting interaction between industry and academic/research institutions.

3.1.5 Sponsored research (whenever needed to solve the specific problems of the industry leading to award of PG/Ph.D. Degree.

3.1.6 To provide interface among the industry, Government and educational and research institutions in secondary steel technology and related areas in India and abroad.

3.1.7 To improve the techno-economy of the industry through:

- Improvement of Production process and reduction in cost of production.
- Process innovation and computerization of production process.
- Quality assurance and improved products.
- Development of New Products.
- Techno-economic evaluation of process know-how with a view to decide on import of technology.
- Evaluation and quality improvement of input raw materials.
- Investigations in futuristic technology.

3.2 These objectives are in line with the report by the Indian Steel Delegation on their visit to the Mini Steel Plants in EEC countries during June '87 (Reference para 2.3 above)

4. EXPECTED BENEFITS:

4.1 The expected benefits to the Industry, from the Institute may be summarised as below:

4.1.1 Steady supply of trained manpower, both technical and managerial to suit the exact needs of the industry.

4.1.2 Availability of updated knowledge to the workforce at different levels leading to adoption of new technology to their advantage.

4.1.3 Analysis of data in Information and Documentation Centre of the Institute to evaluate and identify appropriate process technology.

4.1.4 The development of appropriate indigenous technology.

4.1.5 Quality improvement of the present products and development of new products based on market trends. This will also result in saving of foreign exchange as also improve viability of the unit through increased home demand.

4.1.6 Continuous improvement in performance indices of the industry.

4.1.7 Help in putting up balancing facilities to increase production.

4.1.8 Selection and adoption of appropriate technology, product diversification, optimization of product mix for expansion/modernization of the plant.

4.1.9 Standardization of production of process and input materials.

5. PROPOSED ACTIVITIES:

5.1 PERIODICAL ACTIVITIES

5.1.1 These would include:

a) SHORT-TERM COURSES in the form of refresher, Sandwich Courses etc.

The main thrust will be to evolve a training system for illiterate, semi-literate and literate working hands in the secondary steel industry. All the modern available means of communication would be used, like use of audio visual facilities (i.e. video cassette, slides, cassette recorder etc) which may even include giving instruction in the language understandable by the participants. (The procedure to be followed to meet this end may be in the line as indicated in Annexure-I).

b) SEMINARS both at national and international levels

c) WORKSHOPS

d) OPERATING COMMITTEES in areas like:

-Arc Furnace Steelmaking

-Ladle Metallurgy

-Refractories

-Pitside and Concast Practices

-Rolling of long products

-Rolling of flat products

-Maintenance Practices

5.1.2 The frequency of the above activities would be need based but provision may be made for three activities to run concurrently.

5.2. REGULAR ACIVITIES:

5.2.1 These would cover the following:

a) Two year CERTIFICATE COURSE in technologies of EAF Steelmaking and rolling.

The entrants to these courses would be students fresh from the school, having passed 10+2 with Physics, Chemistry and Mathematics being the essential subjects.

b) Two year DIPLOMA COURSE in technology of EAF steelmaking and rolling.

The entrants to this course would be students fresh from the college, having passed B.Sc. with Physics, Chemistry and Mathematics as essential subjects.

c) ADVANCE DIPLOMA COURSE in specific areas of steelmaking and rolling technology (specialized course). This would be of 6-10 months duration.

The entrants to this course would be experienced supervisory personnel from the secondary steel industry with minimum of B.Sc with Physics, Chemistry and Mathematics or diploma in Mechanical Engineering or Metallurgy or equivalent.

The subjects of the course may be from following areas. The list is only indicative and not exhaustive.

- DRI Technology
- Arc Furnace Technology
- Ladle Metallurgy
- Pitside and Concast Technology
- Refractories
- Reheating Furnace/Fuel Technology
- Roll Pass Design
- Hot Rolling of Long Products
- Hot Rolling of Flat Products
- Cold Rolling and Cold Finishing
- Heat Treatment Practices, disposition technology and coating of steel
- Mechanical Maintenance Management
- Electrical Maintenance Management
- Automation and Process Control
- Quality Assurance
- Basic Computer Science and Capability

Depending upon the demand and limitations of the institutional facilities, 6 to 8 courses may run simultaneously.

d) M.TECH COURSE (18-24 months duration) may be organized by the Institute as and when there is a need from the industry to carry out investigational work in specialized areas of EAF steelmaking, rolling and related technologies.
The entrants to the course would be engineers and/or equivalent with relevant background from the industry with a minimum of 5 years experience. In exceptional cases, fresh entrants to such courses would also be taken. This may also keep satisfied the faculty members with a flair for research.

5.3. RESEARCH AND DEVELOPMENT ACTIVITIES:

5.3.1 Sponsored and/or institutional research in various areas of secondary steel technology may also be organized. This would include investigation on plant problems as also emerging and futuristic technologies. The Fellows for this activity would normally be sponsored by the industry and should have adequate industrial experience and qualifications similar to those in CSIR scheme/system. A Ph.D degree will be awarded on successful completion of the Research Project.

6. GROUP SIZE OF THE COURSES:

6.1 In short-term courses, refresher courses, sandwich courses etc normally 20 participants would be expected in each course. However, provision may be made for upto 30 participants.

6.2 For the two year certificate and diploma courses an intake of 20-25 students is envisaged. However, provisions may be made for 35-40 students should the need arise in due course.

6.3 For the advance diploma courses, the number may be 10-20 students. As mentioned earlier, only 6-8 courses may run concurrently.

6.4 In M.Tech courses, not more than 10 students in the area of steelmaking and rolling may be admitted.

6.5 Number of entrants for the Ph.D courses cannot be predicted as it will depend on the needs of the industry from time to time.

6.6 The number of participants in Seminars and Workshops, National and International would be as normally seen in such cases in the country.

7. TIME FRAME FOR VARIOUS ACTIVITIES:

7.1 Activities against Sl.No. 5.1 (Periodical activities) which do not require equipment and instrumentation facilities for demonstration are proposed to be started immediately with the temporary facilities acquired by the institute. These would be taken up in full swing, when permanent facilities of the Institute come up.

7.2 With the availability of permanent facilities of the Institute, the following courses would be started:

7.2.1 Two year certificate and two year diploma courses. These may be attempted during the last stages of Institute construction, i.e. as soon as few class room are ready and rudimentary laboratory facilities are available.

7.2.2 Advance diploma course 1-2 years after the start of the Institute.

7.2.3 M.Tech courses and regular research may be started after about three years (if and when needed by the industry).

8. ORGANISATION OF NISST:

8.1 The Director will have an Academic Council to advise him on all academic matters.

8.2 He will have two Principal Heads and three Heads of Departments reporting to him as given below:

Principle Heads:

1) Academic Programme, Technology Assessment and Development.
2) Student Affairs, Industrial Services & Planning & Coordination.

Heads:

1) Personnel, Administration & Commercial
2) Finance & Accounts
3) Construction (For the Construction period only)

8.3 The proposed organization chart is given at Annexure-II.

9. LABORTORY FACILITIES:

PHASE 1

9.1 In this phase basic and standard equipments may be installed to demonstrate the validity of the principles in the theory classes for the certificate and diploma courses. This category of equipment will be closely related to the syllabus for each course and may be decided when the latter have been worked out.

PHASE II

9.2 In contrast, the equipments of more sophisticated nature will be installed in this phase. These will be required for Research and Development work. The M.Tech and Ph.D students will use these facilities to have an indepth understanding of the technology involved.

PHASE III (FINAL STAGE)

9.3 In the final stage i.e. after 5-7 years of the commissioning when the expertise developed in the institute is recognized and NISST is accepted as an Institute of national importance, we may venture to install experimental simulative unit of EAF, Ladle Furnace, Continuous Casting and Rolling Mill for experimental/demonstration purposes.

9.3.1 These experimental and demonstration plants will be heavily instrumented so that design condition/operating parameters may be created and the expected benefits may be demonstrated.

9.3.2 These will enable us to simulate the conditions calculated in the mathematical models. These will also help immensely in training and education operators and help in scientific persuit of the steelmaking and process technology.

9.4 The list of major laboratories (including workshop) and their basic functions is given in annexure-III.

PROCEDURE FOR INDENTIFICATION & EXECUTION OF SHORT TERM COURSES

1. Indepth study to assess the sphere of technological gap and to formulate training needs.

2. Discuss the study report in a dialogue session with the representatives of the industries for finalization and execution of annual training programmes.

3. List out and priorate the areas of training.

4. Identify the faculty members and finalize the course materials as well as duration of the courses.

5. Conducting the training courses according to the schedule.

6. Valedictory session to get the feedback from the participants regarding standard of training conducted and improvement/modification needed for future courses.

7. In addition, draw up suggestions on technology improvement during valedictory session and identify the areas where future follow up action is needed to improve the performance of the plant.

8. For close follow up, a Task Force may be formed. The Task Force may consist of representatives of the industries (5 to 10 representatives) and identify the leader from industry.

9. Task Force converts the suggestions to recommendations.

10. One Engineer from NISST will act as coordinator.

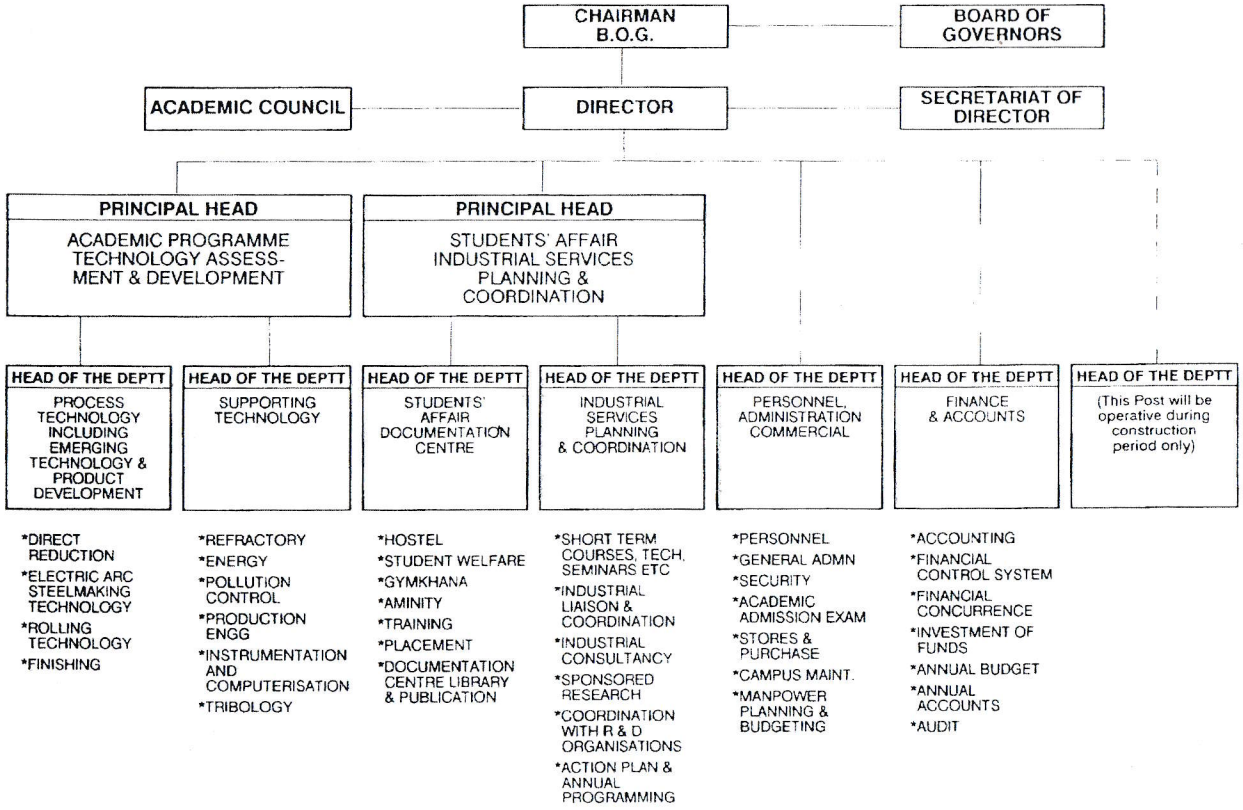
11. Task Force will work under the guidance of the leader for regular follow up (once in a month).

12. The Coordinator will extend all possible help so that Task Force can work effectively.

13. Coordinator reviews progress at three months interval.

ANNEXURE II

PROPOSED ORGANISATION CHART



1. MAJOR LABORATORIES AND THEIR BASIC FUNCTIONS

A. METALOGRAPHY LABORATORY:

Basic Functions:

1. Systematic analysis of Micro Structure.
2. Co-relation of Micro structure with mechanical properties for developing new materials.

B. MECHANICAL TESTING LABORATORY:

Basic Function:

1. For evaluation of mechanical properties, formability, hot ductility characteristics of steel etc.

C. HEAT TREATMENT LABORATORY:

Basic Function:

1. For carrying out various heat treatments like annealing, normalizing, hardening and tempering for different grades of steel.

D. ANALYTICAL SERVICES LABORATORY:

Basic Function:

1. To cater to the entire services analytical needs of different units/ laboratories.

E. MELTING & SOLIDFICATION LABORATORY:

Basic Functions:

1. Development of new steels and alloys.
2. Testing of new ferro alloys and deoxidising agents.

3. To conduct model studies and simulation techniques in the field of solidification and casting, remelting, heating and cooling of steels.

F. INSTRUMENTATION LABORATORY

Basic Functions:

1. Calibration of process instruments.
2. Maintenance of instruments.

G. FUEL AND THERMAL ENGG. LABORATARY

Basic Functions:

1. Studies on fuel and flame technology.
2. Study on combustion technology including burner design.

H. MECHANICAL PROCESSING LABORATORY

Mechanical processing laboratory shall concern two main fields, rolling mill technology and quality of rolled products.

Basic Functions:

1. To determine hot workability.
2. To study plastic deformation.
3. To study internal soundness and surface finish.

2. CENTRAL WORKSHOP

Basic Functions:

1. Fabricate all necessary components required from time to time.

The equipment to be installed in the laboratories and workshop and the estimated cost of each laboratory would be worked out in consultation with the Consultant to be appointed.

NATIONAL INSTITUTE OF SECONDARY STEEL TECHNOLOGY

(Established by Ministry of Steel, Govt of India)

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