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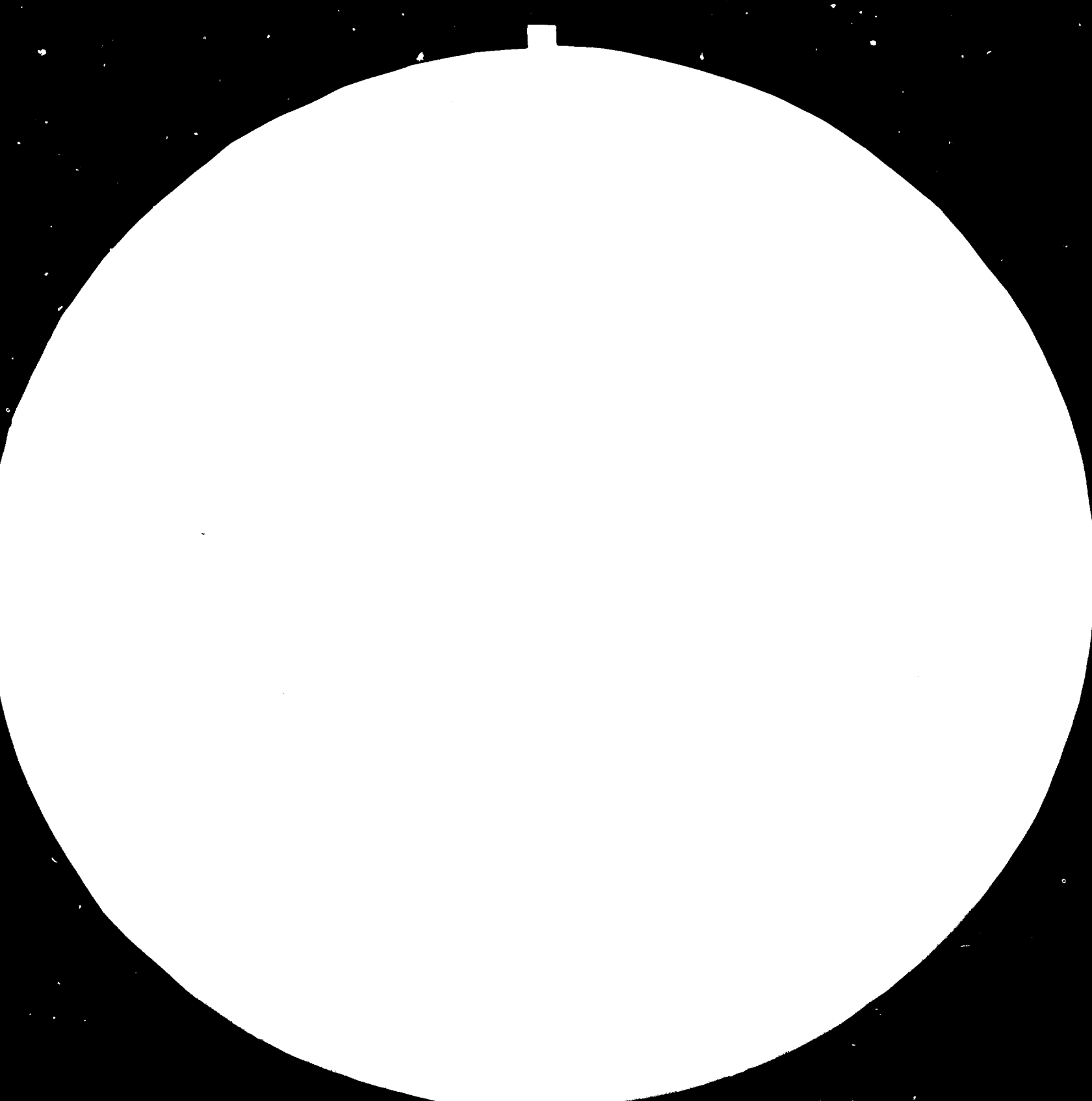

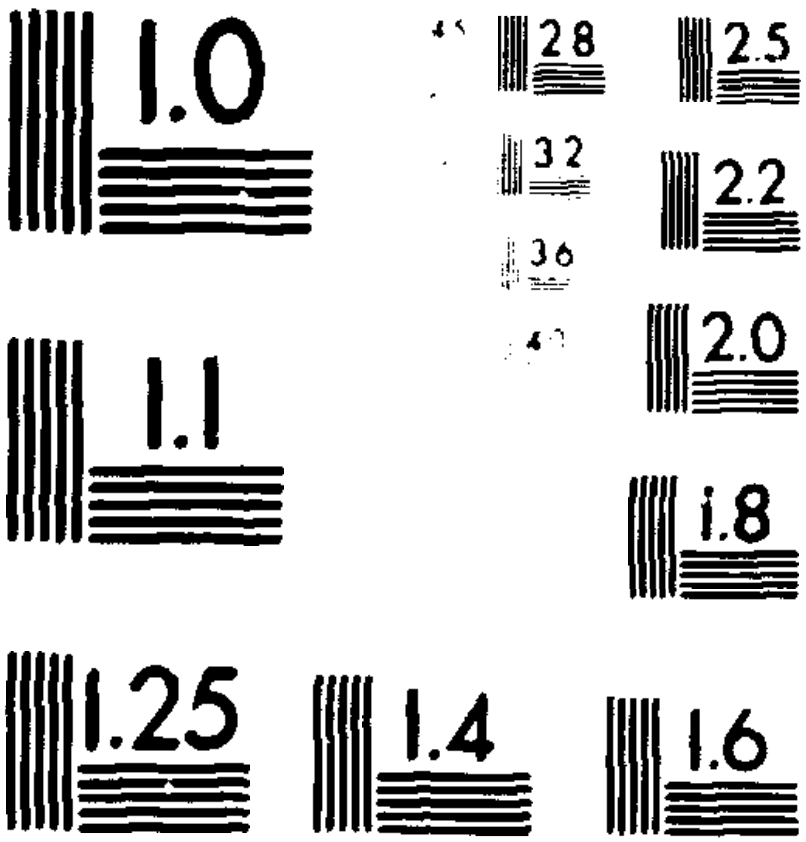

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Workshop on Tinplate Production in the
Asia and the Pacific Region

Jamshedpur, India, 2 - 6 April 1984

REPORT*

(Workshop on tinplate production in Asia and the Pacific region).

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## EXPLANATORY NOTE

### ABBREVIATIONS

| | |
|---|---|
| CFTRI | Central Food Technological Research Institute (Mysore, India) |
| ETP | Electrolytic tin plate |
| CR coils | cold rolled coils |
| GATT | General Agreement on Tariffs and Trade |
| HR coils | hot rolled coils |
| ISO | International Standard Organisation |
| JIS | Japanese Industrial Standards |
| HDP | Heavy Duty Plastics |
| OTSC | Open Top Sanitary Can |
| NML | National Metallurgical Laboratory (Jamshedpur, India) |
| LME | London Metal Exchange |
| TIS | Thai Industrial Standards |
| TCIL | Tinplate Company of India Ltd. |
| TMBP | Tin mill black plate or tempered mild black plate |
| TFS | Tin Free Steel |

CONTENTS



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INTRODUCTION

World production of tinplate was recorded at 11.1 million tons in 1983.

Increases in the demand for tinplate have been experienced by the South East Asian region during recent years. As an example, Singapore was importing 50,000 tons in 1978, whilst Thailand imported 31,800 tons in the same year. Substantial increases in tinplate capacity in this region are in the planning and implementing stage such as by Thailand, Indonesia and Malaysia.

In 1982, the Thai Tinplate Manufacturing Co. has installed a second electrolytic tinning line at its Bangkok works, raising tinning capacity there by 90,000 tpy to 150,000 tpy. The new line will be able to also produce tin free steel which had previously to be imported. In that year tinplate consumption in Thailand had risen to 105,993 tons of which 64,882 tons (including TFS) were locally produced.

Malaysia started up a new electrolytic tinning line in Johor in 1982. Indonesia plans a tinplate factory with an initial capacity of 130,000 tons per year which will make the country self-sufficient in the product towards the end of the 1980ies. Imports foreseen for 1984 will reach 120,000 tons. The tinning line using the Ferrostan process is under construction at a site adjacent to P.T. Krakatau Steel.

The tinplate plant in the Philippines has an installed capacity of 125,000 tons but the Philippines have still to import more than 100,000 tpy to meet the domestic demand.

India is producing around 90,000 tons a year but consumes about 190,000 tons. Their installed capacity is about 300,000 tons.

About 90% of the tinplate produced in the world is used for packaging purposes. This is mainly due to its proved record of non-toxicity, its low energy content in relation to other forms of packaging and its ease of separation by magnetic means which make it a dominant and universal packaging medium. The use of double reduced tinplate (around 25% of all produced tinplate) makes can manufacture even more economic; the high strength of this material can lead to significant economies in can manufacture, because thinner gauge steel can be used for a given product.

The proposal to hold a Workshop on Tinplate Production for the countries of the ESCAP region was originally made during a meeting of the Codex Co-ordinating Committee for ASIA held by FAO in Manila in March 1979 when the Committee learned that in spite of developments of tinplate production in the region several countries were experiencing great difficulties in procuring the right quality of tinplate for canning purposes. UNIDO, as the competent agency in the UN family was subsequently approached to convene such a Working Group to discuss the status of tinplate manufacture in the respective countries of the region, latest technologies for tinplate manufacture and appropriate quality standards, pooling of resources in the manufacture of blackplate, tinplate, coating material and introduction of alternative packaging material, such as tin free steel plate and galvanized sheets. The deliberations of the Workshop were to constitute a basis for co-operation between material suppliers, tinplate manufacturers and can manufacturers and canneries in the region.

Organization of the Workshop

The Workshop on Tinplate Production in the Asia and the Pacific Region was held at the Tinplate Company of India Ltd., Jamshedpur, India, from 2 - 6 April 1984. The Workshop was attended by 31 participants and observers from the following countries: India, Indonesia, Iran, Republic of Korea, Pakistan, Thailand and Turkey. UNIDO was represented by the Senior Interregional Adviser from UNIDO HQ, Vienna. FAO deputed one consultant who is attached to the CFTRI (Central Food Technological Research Institute) in Mysore,India.

The list of participants is given in Annex I.

Opening Session

The Workshop was officially inaugurated on 2 April 1984. Opening addresses were held by Mr. Lovraj Kumar, Secretary, Department of Steel, Government of India, Mr. R.K. Bhasin, Managing Director, The Tinplate Company of India Ltd., and Mr. B.R. Nijhawan, UNIDO Senior Interregional Adviser.

In his inaugural speech Mr. Lovraj Kumar referred to the fact that the tinplate industry had many competitors in the non-metallic packaging production but that there were also new fields coming up where tinplate could make an entry. Glass containers which were still in use could advantageously be substituted by tinplate and other possibilities for tinplate outlets should be investigated. New application areas would have to be identified. He referred to the efforts of the National Metallurgical Laboratory in their investigations of recovery of tin from the sludge. Tin free steel plants could usefully be established in countries where chromium deposits were available.

He appreciated the holding of the Workshop in the spirit of technical co-operation among developing countries, an effort where India is always in the forefront.

In wishing the Workshop every success he looked forward to being informed about its results and recommendations in which he would take personal interest.

Dr. B.R. Nijhawan, Senior Interregional Adviser, UNIDO,then conveyed the greetings of UNIDO's Executive Director, Dr. Abd-El Rahman Khane.

In referring to the various origins of the delegates he solicited their views and opinions relating to all aspects of tinplate production (financial, technical, commercial as well as personal). World tinplate consumption was of the order of about 13 million tons per year, which constituted about 2% of global steel production. He then referred to tinplate production in India, which was about 90,000 to 100,000 tpy against a demand of about 180,000 - 190,000. The price of tin in India being extremely high, The Tinplate Company of India Ltd. (TCIL) had set up a tin free line (TFS) for chromating black plate.

The last Conference on tinplate production that UNIDO held was in Santiago, Chile, in 1972. After more than 10 years had passed UNIDO found it opportune to discuss the subject in the light of recent developments, on a regional basis.

The objectives of the Workshop were to highlight the status of the tinplate and TFS industry, latest technologies and to develop a programme for future action. The deliberations of the Workshop, he mentioned, would constitute a basis for co-operation between raw material suppliers, tinplate manufacturers and canneries in the ESCAP region countries. He stressed the importance of technical and economic co-operation among developing countries (TCDC) which received full UNIDO support. Within the UNIDO fellowship and training programmes he was sure that India would accept trainees from other developing countries who want to learn more about tinplate production.

Dr. Nijhawan then informed on the activities under UNIDO's technical assistance programme for developing countries which was undertaken on official request by the Governments of such countries and the provision of experts and consulting firms, the organization of training programmes and the procurement of certain equipment items for research and development laboratories or pilot plants. Total technical assistance delivery of UNIDO in all industrial fields was reported to be around 90 million US dollars per year. He then cited a number of projects which were established or supported with UNIDO assistance, such as the National Metallurgical Laboratory where central creep testing facilities were established with UNIDO assistance, and a number of other R and D institutes which were set up in various parts of the developing world. More sophisticated technology, such as the establishment of a silicon technology centre in Pakistan and the introduction of computerized managed maintenance systems in plants in Hungary, CSSR, Egypt also fell, he informed, under the purview of UNIDO.

Expressing his best wishes for a successful and fruitful Workshop he looked forward to recommendations for actions to be taken by developing countries with regard to the future development of the tinplate industry.

Mr. R.K. Bhasin, Managing Director, The Tinplate Company of India Ltd., the co-organizer and host of the Workshop welcomed the participants and transmitted the greetings of Mr. Rusi Mody, Chairman, TCIL for a successful Workshop. He particularly appreciated the presence of the Secretary of Steel, Government of India, and the Iron and Steel Controller and thanked UNIDO for enabling the holding of such a Workshop which brought together participants from various developing countries, various Indian tinplate manufacturers and canneries and a consultant from the Food and Agricultural Organisation. He mentioned that tinplate producers were confronted with several problems including severe competition from non-metallic packaging materials like glass, plastics, aluminium. There was a worldwide under-utilization of capacities, mainly due to high production and raw material costs. He looked forward to these subjects being treated at the Workshop for the mutual benefit of all concerned.

The vote of thanks was given by Mr. Kumaraswamy, Chief of Quality Control, The Tinplate Company of India Ltd.

Election of Officers

The Workshop elected Mr. R.K. Bhasin as Chairman. Messrs.Sugema, Indonesia and Kyung Whan Lee, Republic of Korea, were elected Vice-Chairmen.
Mr. P.K. Banerjee was assigned the tasks of the Rapporteur.

Programme of the Workshop

During 4 technical sessions 11 lecture or country papers were presented or oral presentations made by TCIL staff members, participants and observers. The list of lecture papers is given in Annex II. Summaries of the presentations are contained in the respective Chapters of the Report. The Programme of the Workshop is given in Annex III.

On the occasion of the Workshop, The Tinplate Company of India Ltd., brought out a supplement in the leading National Daily, the Statesman.

The following plants were visited by the participants: The Tinplate Company of India Ltd. (Ferrostan ETP/TFS line), The Tata Iron and Steel Company (TISCO) and the Tata Engineering and Locomotives Company (TELCO). On request, participants were given an opportunity to visit other plants and institutes such as the Indian Tube Company or the National Metallurgical Laboratory.

CONCLUSIONS AND RECOMMENDATIONS

During the deliberations of the Workshop the following conclusions and recommendations were reached:

1) Tinplate producers (including tin-free sheet producers) in ESCAP developing countries should form Tinplate Manufacturers' Associations on national basis in order to:

   a) Co-ordinate and obtain requisite raw materials (cold coils), etc. at lowest possible costs instead of directly importing tinplates with the latter's attendant high foreign exchange costs to the country.

   b) Endeavour to achieve highest possible installed capacity utilization on the basis of optimum supply of raw materials (cold coils, tin, fluxes, etc.).

   c) Co-ordinate the pattern of product-mix essentially needed for the domestic markets, with reasonable/possible exports.

   d) Ensure low production (conversion) costs for the tinplate (tin-free sheets) manufactured in unison with higher productivity, yield figures and optimum quality of product-mix.

   e) Maintain optimum selling prices for the product-mix consistent with national interests and policies.

   f) Endeavour to decanalize the supply and/or imports of raw materials (cold coils, etc.) in order to ensure lowest possible import costs in foreign exchange and local currency payments.

   g) Exchange and disseminate statistical and technical data amongst the Member manufacturers of the Association and possible technology transfer and interchange, training potentials.

   h) Formulate, hold/maintain price lines of tinplate/tin-free product-mix on mutually acceptable basis consistent with optimum profitability and national policies/guidelines.

i) Integrate can manufacturing industry with the tinplate industry to ensure overall improved economics of tinplate/cannery industry.

2) UNIDO should provide within its financial and physical resources, on requests from individual developing countries, technical assistance for:

a) Techno-economic appraisal of new projects for tinplate industry in the ESCAP developing countries including evaluation of equipment costs and latter's quality and suitability of the equipment supplies for use in developing countries.

b) Technical expert's assistance in tinplate plant operations (productivity, quality control, cost reductions, plant maintenance).

c) Technical assistance for training of plant personnel (technology, plant operations) and study tours including in-plant group training.

d) Endeavour to furnish technical/technology data wherever and to the extent possible on a Data Bank basis, to developing countries on request.

3) UNIDO should, as far as possible, monitor the utilization of installed tinplate capacity, tinplate production and consumption in the ESCAP developing countries and promote bilateral/multilateral co-operation on the basis of TCDC (Technical Co-operation amongst Developing Countries) concepts advocated by the UN system.

4) Tinplate producers in the ESCAP developing countries should formulate and apply national standards for tinplate (tin-free) product-mix; UNIDO could supply technical experts' assistance in the field of standardization to developing countries on request.

5) Governments of respective ESCAP developing countries should co-ordinate the workings of the tinplate producers in the public and private sectors; they should be able to obtain their raw materials' supplies to the best of their individual and national interests, jointly or individually as appropriate in each country/case, without central canalization or undue canalization.

6) Governments of respective ESCAP countries should take steps to effectively utilize the installed tinplate industrial capacity in the country; any additional capacity, it is recommended, should be judiciously set up in line with the projected growth of domestic tinplate markets.

7) A close study should be maintained by the Agencies concerned on the growth of product-mix meant to substitute/replace tinplate.

# The Status of Tinplate/Tin free Steel in India with Special Reference to the Products of the Tinplate Company of India Limited, Jamshedpur and the Scope for Co-operation between Asia and Pacific Region

By

R.K. Bhasin, Managing Director, TCIL and

G. Senapati, Technical Assistant to Managing Director, TCIL

SUMMARY

The manufacture of tinplate began first in India in 1922 when Tinplate Company of India Ltd. was installed with an annual capacity of 28,000 tonnes. Today, there are 3 manufacturing units with installed capacity of 300,000 tonnes in a year.

Looking at last 10 years figure, one finds the tinplate indigenous production has remained almost stagnant in the last 10 years, at about 100,000 tonnes per annum. The capacity has been utilized to the extent of 33%. Even though the packaging industry has grown, indigenous tinplate market share has reduced due to increase of imports to the tune of 90,000 tonnes in a year and due to substitutes like polyethylene, aluminium foil, plastic containers, composite containers and black plates. The reassurance conditions in the ways have led to dumping of tinplate products in India. Due to this heavy competition the indigenous manufacturers have not been able to compete after absorbing heavy increase in cost of all inputs including wage demands. The paper indicates import of tinplate at depressed rates is a dangerous practice in the long turn perspective of a nation.

The threat to tinplate industry is posed also by use of recycled cans for packing hydrogenated oils and edible oils. In the long turn, this may pose national health hazard. Use of waste-waste by unscrupulous businessmen in place of tinplate prime has eaten up the market for tinplate prime This is also detrimental to national health. The paper also indicates the increase of black plate on tinplate market. This also deals with the fact that 10,000 tonnes of OTSC quality tinplate is imported to India, whereas the country has the capability to produce this. To some extent the policy on tinplate imports and duty levied on the raw materials required for tinplate industry has affected tinplate pricing which has made it less competitive.

The paper suggests remedial measures to counter threats. The paper also suggests that to make the public aware of the advantageous credit out of using tinplate promotional measures should be taken. The less energy consumption for manufacture of tinplate and the tinplate cans and versatile credits like its ability to store processed food longer than any other packaging material, its aesthetic look and recycling of magnetic tinplate cans out of the garbage to the steel making wings as steel scrap are advantages not enjoyed by other packaging mediums.

## Scope for bilateral co-operation

The paper has discussed the production capacity, future plans and consumption of tinplate in various countries of the region and has concluded

that there had been excess capacity in the Region in few countries and no capacity in certain others. This may pave way for bilateral and multi-lateral co-operation between the countries for export-import of tinplate.

The paper also suggests that the experience of tinplate producing countries can be shared not only in the technical field but also in the commercial field.

The paper welcomes the efforts of UNIDO and FAO to build a fruitful bilateral/multi-lateral co-operation between ESCAP countries to foster the tinplate industry.

The TCIL Experience

The paper also discusses in detail the experience of TCIL in the installation of ETP/TFS line, production, quality control, and product development areas to make tinplate/tin-free steel available at a competitive price. It also suggests that tin-free steel will be promoted in Indian market highlighting its unique qualities, which can benefit the customers.

## Experience of TCIL in Tinplate Production

By P.K. Banerjee and C.G. Ghosh

### SUMMARY

The paper attempts to project the state of technology relating to tinplate production at TCIL.

It gives the salient features of TCIL's dual ETP/TFS line which is capable of processing TMBP coils with thickness ranging from 0.17 to 0.60 mm using the US Steel developed Ferrostan and TFS III processes.

An analysis has been made of the coil inputs, product-mix, yield and rejections, and plant performance for the year 1983.

Quality control efforts and the steps taken to combat various quality/operational problems, some of which such as scratches and smudge have been overcome, are also outlined.

Based on TCIL's limited experience in TFS manufacture, an attempt has been made to identify the critical factors involved in TFS production. Stringent surface finish requirements of TMBP coils, close control of plating parameters, selection of optimum line speed, use of appropriate rubber rolls and the need for expensive plant maintenance and sophisticated equipment for process and quality evaluation are some of the critical factors involved.

A special mention has been made of TCIL's TMBP coil requirements with regard to the need for a optimum rust preventive oil coat on the strip and a waterproof and rigid coil pack to prevent rusting and mechanical damage in transit.

DISCUSSION

One participant inquired whether the technology of the ETP/TFS line as existing at TCIL could be passed on to other countries without restriction and it was suggested that interested parties should contact the TATA Group for Project Engineering and India would be happy to assist.

It was noted that the installed capacity for tinplate production in India was 300,000 tons while only 96,000 tons were locally produced in 1982. Another 90,000 tons were imported to meet the market demand of about 136,000 tons.

It was suggested that instead of importing tinplate more imports of TMBP coils should be allowed for producing the tinplate requirements locally and thereby utilizing existing capacity up to about 2 thirds. Imports of TMBP coils would certainly be less costly than import of the same amount of tinplate. TCIL informed that heavy duties are being levied on imported coils which made tinplate production in India very costly and tinplate imports, particularly from GATT countries could be obtained at more favourable prices. If concessions could be obtained from the Government to waive such duties the tinplate industry would certainly become competitive in producing value added products like tinplate and savings in foreign exchange would be attained as it was definitely cheaper to import the coils than to import tinplate.

UNIDO suggested that an analysis should be made and the aim should be to undertake all necessary steps to remedy the existing situation for the benefit of the nation. TCIL should also be given the opportunity to investigate independently who the cheapest TMBP coil suppliers were and obtain such coils when the market prices are low. If the Government had agreed that an installed capacity of 300,000 tons could be established provisions should also be made to allow the companies to utilize such capacity and remain, at the same time, competitive. This would entail free choice of suppliers by the companies. Cheaper GATT country imports of TMBP coils could be considered.

It was noted that there was no growth recorded in worldwide tinplate consumption, due to the strong competition from other materials like plastic and aluminium which entered the market. It was reported that lubricants in India were packed in plastic containers and black plate containers.

As far as the utilization of capacity of the TCIL was concerned, the 90,000 tpy capacity plant was intended to be run only on a two shift operation, with an envisaged production of 60,000 tons. TFS consumption was very low. The can making industry would have to be encouraged to step up the use of TFS for certain purposes. Participants were informed that the ETP/TFS plant was established in 1975 based on the assumption that the TMBP would be delivered from the Bokaro Plant. Plans for manufacture of such coils were inordinately delayed by that plant and, as a consequence all demand had to be met through imports. It was expected that TMBP coils would become locally available in the near future, when Bokaro comes on stream in 1985.

It was also noted that there was a tendency by tinplate can manufacturers to import cheap waste/waste from abroad. Such cheap waste/waste could also be produced locally provided the Government permitted the import of cheap overrun coils. It was strongly proposed that tinplate imports, if any, should be restricted to the actual consumers, i.e. the tinplate can manufacturers and not traders.

Several questions were posed relating to the operation of TCIL. It was reported that coil defects were about 8% which caused various operational problems and affected yield.

Decisive factors for profitability of a plant were mentioned to be continuous uninterrupted operation of the tinning line and availability of reasonably priced raw materials.

Recent figures of tinplate production and capacity in the world as obtained from the International Tin Council, were given to the participants and are given below:

Tinplate production and capacity in 1982 (in 1000 tons)

| | Production | Capacity | Capacity Utilization |
|---|---|---|---|
| USA | 2.714 | 5.722 | 47 % |
| Japan | 1.639 | 2.238 | 73 % |
| Europe | 4.368 | 7.178 | 61 % |
| Other countries | 2.421 | 4.797 | 50 % |
| | 11.142 | 19.935 | 56 % |

More detailed information on world tinplate consumption 1968-1980 and tinplate, blackplate and TFS deliveries were handed out to participants.

## Background of the project regarding the organization of a Workshop on tinplate production for countries of the Asia and the Pacific

By Colonel O.P. Kapur, FAO Consultant, CFTRI, Mysore, India

SUMMARY

The proposal for holding a Workshop on Tinplate Production for ESCAP region countries originated from recommendations made at the second session of the Codex Alimentarius Co-ordinating Committee for Asia held in Manila during March 1979. At that meeting FAO consultants presented a report based on visits to six countries of the region, namely Thailand, Malaysia, Indonesia, Philippines, India and Iraq. One of the main recommendations highlighted was "that in spite of the developments in the tinplate production in the region, several developing countries were experiencing great difficulties in procuring the right quality of open top sanitary cans (OTSC) tinplate for canning purposes. A number of other difficulties were also experienced, such as unavailability of prime quality tinplate. Cases occurred where processed food products packed in differentially coated cans landed rusty at the importers ports due to insufficient tin coating.

At present there are no standards laid down for OTSC in developing countries to check the quality of imported tinplate from developed countries. The need to develop Codex Standards of OTSC tinplate and lacquer was considered essential for processing foods. India has developed Indian Standards (IS: 9396-1979) for round open top sanitary cans for processed foods.

Such considerations have led the Codex Co-ordinating Committee for Asia to request UNIDO to consider the feasibility of convening a Working Group from countries of the Asian region with a view to developing co-operation amongst those countries for the manufacture of the right quality of tinplate from indigenous sources and other appropriate cheaper packaging materials.

DISCUSSION

The FAO consultant hoped that the deliberations of the Workshop would constitute a basis for co-operation between the raw material suppliers, tinplate manufacturers, can fabricators and canners in the region in the coming years.

Due to the large overcapacity in the world bilateral co-operation among the developing countries in the various regions was considered necessary. Any monopolistic situation should, however, be avoided. The gap between installed capacity and production shculd be fully utilized. It was, however, agreed that for socio-economic reasons countries may be prompted to establish their own tinplate facilities even if overcapacity in the region existed.

It was recommended that TCIL representatives be present at the meetings of the All India Food Preservers Association which consists of representatives of can fabricators, canners of the country on the plant's capabilities to clarify technical points relating to plant capabilities and product quality.

The introduction of HDP containers for packaging vanaspati posed a severe health hazard as consumers intended to misuse such empty containers for other purposes such as storage of pickle, liquids,oils, etc.

TCIL agreed to prepare a brief on the company's capabilities to be handed over to CFTRI for future considerations for the packaging industry. Now that tinplate was available in the country it was agreed that the plastic containers which started entering the market gradually should no longer be used, due to the health hazards resulting from misuse as mentioned above. It was agreed that a joint approach to the Government authorities would be made in this respect. First of all it was suggested to work out the economics regarding the suitability of using tinplate cans viz HDP containers for 1 kg and 2 kg packs for hydrogenated oils.

The get-to-gether and holding of a yearly or 6 monthly meeting between manufacturers of tinplate and tinplate consumers was also considered to be an advantageous proposal so that achievements reached and new developments could be discussed. Eventually, the formation of a Tinplate Manufacturers Association may be considered.

For tinplate containers to be competitive on the market certain concessions would have to be obtained and the waiving of the excise levy by the Government would be a point for negotiations and discussion.

The FAO consultant reported that when using differentially coated tinplate of the D 25/100 type rust formation was observed. However when D 50/100 type tinplate cans were used, conditions were satisfactory, if lacquer was applied.

The Workshop was informed that the Association of Food Scientists and technologists of India will hold a convention in June and it was suggested that TCIL might consider to become a member. Through its Journal, the Association provides information on the problems of the canning industry and can manufacturers which might be useful for a tinplate producer to know about.

## Recovery and Recycling of Tin in a Tinplate Plant

By Dr. V.A. Altekar, Director, National Metallurgical Laboratory (NML), Jamshedpur

SUMMARY

Increasing price of tin coupled with difficult economic and market conditions dictate that the tinplate industry gives adequate consideration to improve the economy of tin metal from in-house waste products.

The tinplate industry, whether based on the old hot dip system or the new electrolytic one, provides ample opportunities for recovery and recycling of the costly metal and thereby substantially contributes to the economic operation of the plant.

Tin bearing products can be classified as follows: predominantly metallic in nature (tinplate waste of tinning and canning operations; tin dross or scruff)and predominantly oxidic in nature (tin ash, tin slags, sludge, etc.). If the plant is involved in downstream industries additional scrap becomes available at site (spoiled cans during manufacture, used cans from consumers).

The NML has carried out extensive work on the recovery of tin from various secondary resources and the following processes were developed, tested and confirmed on large scale: tin sludge from FTP lines; sponge tin from detinning units; tin dross and scruff from hot dip tinning units; tin slag from smelting units. In each case a metal recovery of over 95% with a minimum purity of 99.5% was obtained by using simple pyrometallurgical routes. The process for the treatment of tin sludge is already being commercially exploited and the process for sponge tin has been licensed to a firm in Calcutta. The paper gives a short summary for each of the processes.

Tinplate scrap from tinplate companies or canneries is usually available in loosely packed bundles. In the case of TCIL, Jamshedpur, these are 50 kgs bundles which can directly be put into the electrolytic tank as anodes. For cans and containers, pretreatment like removal of paints

and enamels and shredding may be necessary. However the overall recovery of tin in the form of metal and as compounds like sodium stannate, tin oxide etc. recoverable from the electrolyte, and also the recovery of clean detinned steel scrap, have bright prospect and the extent of profitability of such recovery on large and organized scale in developing countries like India may be examined by preparing a detailed project report. The same is also true of incorporating recovery units for processing of sludges, scruff and slags which can yield the tin values and boost up the sagging economy of tinplate industry.

DISCUSSION

Questions about the economic feasibility arose. It was explained that in the case of India and any other country without the necessary raw materials, metal recovery was always advisable in order to save raw materials and costly imports. A small recovery unit could always successfully be set up which would fully be justified looking at the price difference between the sludge and the metal, the more so, as a high recovery rate (about 95%) and a metal purity of about 99.75% can be attained.

The Thai participant fully agreed that tin recovery from sludge was very important. He questioned about the problem of pollution, i.e. waste water contaminations from treatment. The NML representative informed that this problem had thus far not been referred to him but felt that the sludge after filtration could be fed back into the system.

Asked about the economical plant size participants were informed that in the case of India a small recovery unit for 2 of the existing 3 tinplate producers would be viable.

## The Tinplate Project in Indonesia

By Mr. Sugema, Chief of Sub-Directorate of Metal and Basic Products

SUMMARY

At present Indonesia imports all its requirements of electrolytic tinplate from various countries around the world such as Japan, Australia, USA, EEC, etc. Tinplate consumption has been increasing progressively over the past years and the indications for 1984 are that over 120,000 tons will have to be imported. About 45% of the imports are prime quality and 54% waste/waste. Tinplate consumption in 1980 was 112,000 tons. The market growth rates are about 8% per year.

The establishment of tinplate facilities in Indonesia has been studied on several occasions over the past years by a number of entrepreneural groups. A feasibility study has been prepared on the investigation of the possibility of establishing an electrolytic tinplating line in Indonesia, by Kaiser Eng. Int., in co-operation with P.T. Krakatau Steel. Facilities required for this purpose have been featured in the Master Plan for P.T. Krakatau Steel. Indonesia is one of the few major countries in south-east Asia without an electrolytic tinplate production facility. The plant is proposed to be set up in the industrial area adjacent to P.T. Krakatau Steel at Cilegon. The suggested process is a ferrostan type electrolytic

tinning line with a nominal capacity of 130,000 tpy. This capacity will be reached within 3 years in stages of 60, 90 and 100% respectively. The product mix will consist of 72% prime sheet, 18% prime coil and 10% waste/ waste.

It is estimated that the consumption will range between 154,000 and 177,000 tons by the mid 1980ies. On the assumption of an annual growth rate of 8%, by 1990 a consumption of between 200,000 to 240,000 is envisaged, which would increase by the year 2000 to 300,000 to 350,000 tons per year.

The project will be implemented by The Tinplate Company which was established in August 1982. Share holders are 2 State companies (P.T. Krakatau Steel and the Tin Mining Company) and one private company. Site preparation was started in September 1983. The project is expected to be completed in May 1985 with the trial run to take place in June - August of the same year.

DISCUSSION

It was explained that the plant to be established will be a joint venture with the Government of Indonesia. In this connexion one participant suggested that UNIDO should assist developing countries planning the establishment of such plants in the evaluation of bids, appraisal of the offers and selection of the most suitable process, to ensure that the best possible technology can be obtained at a reasonable cost. The Indonesian plant as proposed in the feasibility study seemed to exceed expected requirements. UNIDO informed on its experience regarding the appraisal of industrial projects and technical assistance advisory services and expressed its willingness to undertake such tasks whenever officially requested by developing countries.

It was noted that presently imports of tinplate into Indonesia included shipments from countries like USA and Venezuela. It was recommended to consider supplies from within the ESCAP region.

Considering the overcapacity of tinplate production facilities in the world, the question arose why Indonesia had chosen to set up their own facilities instead of importing available tinplate. It was explained that the country was mainly looking for an outlet of TMBP coils produced by Krakatau Steel and the large demand for tinplate in Indonesia (about 120,000 tons expectedly in 1984). Another factor was the creation of employment and the availability of tin in the country. A number of downstream and ancillary industries would also be created. The production cost factor was in this case not the most decisive, the creation of a new industry in the country which would help saving foreign exchange and absorb available labour, was the objective.

The question for new application areas of tinplate was raised. 90% of the present world production of tinplate is absorbed by the packaging industry. Other applications may be expanded such as use of tinplate for air and oil filters, light engineering purposes, kitchen utensils, battery cases, toys, etc.

## Canning Industry in Iran

By Mr. F. Bassir Shabestari, Specialist in Metal Industries
Ministry of Industry, Tehran, Iran

### SUMMARY

Iran has no experience in tinplate production. All the tinplate is being imported. At present 12 factories produce cans. The total production capacity for cans is about 250 million per year. It is envisaged that by 1987 600,000 millions will have to be produced. In the last year, in addition to local manufacture of 270 million cans another 160 million were imported.

It is the Government's policy to aim for self-sufficiency in the country and imports of finished goods will be restricted to a minimum. It is expected that within a period of about 3 years no more cans will be imported, only tinplate imports will be allowed for can manufacture. At present 70-80,000 tpy of tinplate is being imported of which 20-25,000 tpy for general purpose food packaging, 40,000 for liquid and solid edible oils and fats packaging and about 10,000 - 15,000 for other usages. Common gauges range between 0.22 mm to 0.25 mm.

On intended establishment of a factory in Iran, certain parameters have to be met and the total cost of the factory per year would be elaborated. The value of the raw materials used should account for about 50-60% of the total cost, whilst the salaries should be in the range of 15-25% of the total cost. If these parameters can be attained, permission to establish the factory is granted.

### DISCUSSION

The participants were informed that Iran obtained its imported tinplate mainly from Japan, FRG, Spain and a number of other countries. Cans were mainly produced in 5 sizes: 300 grams (for beans), 330 grams (for fruit juices), 500 grams (for sauces), 1 kg (for pickle) and 5 kgs(for sauce and cheese). The most common sizes were 500 gram cans accounting for about 50% of production, 300 and 330 gram cans accounting for about 20% each of the market share and 1 kg and 5 kg cans with 5% of the market share each.

The tendency to self-sufficiency in can production was considered important for the country.

The Iranian participant welcomed the opportunity given to him to exchange views on tinplate production and tinplate usage.

## Tinplate Production in the Republic of Korea

By Mr. Kyung Whan Lee, Managing Director, Dong Yang Tinplate Company

### SUMMARY

In the Republic of Korea, three tinplate mills are in operation: Dong Yang, with a capacity of 200,000 tons per year (2 Halogen lines with 125,000 and 75,000 tons capacity, respectively).

Dong Jin, (Ferrostan line with 120,000 tpy capacity). Shin Hua (20,000 tons per year capacity, Ferrostan line).

The domestic consumption in 1983 was 101,800 tons (including tin free steel). 47.6% of the market share was held by Dong Yang, whilst Dong Jin and Shin Hua accounted for 36 and 16.4% respectively.

The Dong Yang plant was founded in 1959. Hot dip tinning lines were installed in 1962, 1964 and 1966. In 1967 a small (20,000 tpy) Ferrostan electrolytic tinning line was established. With the increasing local demand for tinplate which had a growth rate of 30% between 1968 and 1978, two new lines (Halogen type) were established in place of the small Ferrostan line.

Meanwhile Shin Hua installed another hot dip tinning line. Pohang Steel Plant had plans to also establish an electrolytic tinning line but was discouraged to do so since sufficient capacity was by then already available in Korea.

The product mix of Republic of Korea tinplate plant in 1983 was as follows: cable covers (1,090 tons), battery bodies (1,800 tons), dry mix (5,100 tons), crown corks (13,390 tons), sanitary cans (32,200 tons), mushroom cans (1,000 tons) general cans (44,720 tons) and exports 30,000 tons; no beverage cans were produced.

There is heavy competition among the three mills in the Republic of Korea. In 1982 the production of NICE-TOP and galvanized sheet was introduced by Dong Yang. The range of tin coatings is mainly: 25: 25 (30.8%), 50:50 (21.5%), 25:100 (14.3%), 25:75 (11.8%), the remainder ranging from 10:10 to 100:100 plates is within the range of 0.1% to 4.2%.

Initially, when the line was established in 1975 difficulties in mechanical maintenance occurred and plating tanks as well as preplating tanks used to get corroded fast. This problem could be solved by using totally FRP moulded tanks which are easy to maintain.

DISCUSSION

Questions were raised regarding the merits and demerits of the Halogen process and the Ferrostan process. The Korean participant was of the opinion that no substantial differences existed; however the selection of the process had to be made on a country-by-country basis considering all the local conditions. The Halogen process requires a larger surface area and thus maintenance was made easier. The Ferrostan line requires a deeper foundation and ground digging. The sludge formation in the Halogen line was reportedly 2 times larger than in the Ferrostan line. Participants asked that a comparative table of the two processes be prepared.

Inquiries were made why such a large capacity was chosen while the market requirements were only about 110,000 tons South Korea. It was explained that this was due to the fact that the consumption of tinplate used to triple every third year in the past, whilst growth rates in recent years

were very modest. For 1984 the company plans to produce 39,980 tons for domestic market consumption of tinplate, 15,600 tons of Hi TOP TFS, 1,100 tons of NICE TOP, 10,000 tons of galvanized sheet. 41,630 tons of various product mix are meant for export out of a total of 100,130 tons envisaged to be produced.

In the Dong Yang plant, pickling is done by dipping although facilities for electrolytic pickling are available. It was considered important to establish 2 cleaning and one pickling line, if the DOS film on the blackplate was heavy. In the case of the Dong Yang plant the coils are supplied by POSCO in an unoiled state. For the Halogen process, a high mill speed would yield better quality. The current requirement depends on the brightness requirement.

Concerning the price for tinplate which the company quotes participants were informed that this was a fixed price for the local market which included all direct costs (raw material, operating costs, overheads) plus some profit. The export price only covered the direct costs. No Government subsidy is provided. The quality control had to be based on parameters so as to allow some profit for the company. For instance, containers for lubricating oil would be of lower quality than that required for crown corks which demands the utmost quality and precision. Production had to take due account of the consumers' needs. In Dong Yang all crown corks are produced with TFS. If tinplate was to be lacquered or printed, TFS could be used just the same. When applying Nice-Top (electroplated with nickel) inside lacquering was to be provided. Nice-Top can be welded in the same way as ordinary steel sheet. Hi-Top (electrolytic chromium-coated steel sheet) has poorer properties for soldering.

Asked whether the Dong Yang plant would accept trainees from other developing countries under the UNIDO auspices, the Managing Director felt that this was possible. It would be investigated whether such services could be rendered free of charge. The plant is prepared to make experts available to UNIDO, for short-term assignments in developing countries.

## State-of-the-art of Tinplate Manufacture in Pakistan

By Mr. Iqbal Ahmed Raza Kazi, Project Manager, OMEGA Tinplate Co. Ltd. (Proposed)

### SUMMARY

Pakistan, so far, does not have any tinplate manufacturing plant, though there have been plans in the 1960ies to establish a 100,000 tpy ETP line. Efforts to have a tinplate plant have gained considerable momentum since the partial commissioning of the first integrated steel plant in August 1981. Till recently all steel product requirements were imported. With the setting up of the first steel mill, the country will become self-sufficient in products like billets, HR coils and sheets, CR coils and sheets, galvanized sheets, etc. Steel products like tinplate, rails and heavy structures would still continue to be imported.

Tinplate consumption in Pakistan is about 77,000 tons per year, the requirement for primes being about 50-60,000 tons. It is projected that the demand will raise to 113,000 tons by 1990 and to 200,000 tons by the year 2000.

There are 4 proposed projects for establishing tin plant facilities. The OMEGA Tinplate Co. Ltd. (proposed) is suggested to be set up with a 45,000 tpy capacity, with possibility for expansion to 80,000 tons. The Karachi tax free zone is proposed as location for the plant.

There is no provision in the present set-up of the Pakistan Steel to produce black plate and it has been decided to install a 5 stand tandem mill with all necessary equipment within the cold rolling mill complex.

DISCUSSION

In view of the foreseen establishment of a ETP plant in Pakistan, the Pakistani participant was very keen in obtaining more information regarding the future market of tin and tinplate as well as TFS. The available processes would have to carefully investigated and compared before a final decision was taken.

Proven tin reserves were reported at 10 million tons and would last for at least another 30 years. If tinplate production of around 14-15 million tons per year was assumed worldwide, the tin consumption would be around 72-73,000 tons per year. New tin deposits may also be located and Indonesia was now investigating off-shore reserves.

If the price escalation that had taken place over the last decade or so would continue in the same proportion, tinplate production would become too costly and uneconomic and alternatives packaging material would have to be produced, such as TFS. No major competition from aluminium sheet was expected as aluminium prices were predicted to rise at an average of 17% a year.

The prices of the tin ingots were a major concern particularly to India. Whilst about 25,000 - 30,000 Rs had to be paid for 1 ton in 1971 this price had risen to 10 times as much 10 years later. It was found that the LME quoted prices were substantially lower than those prices which the Tinplate Company of India Ltd. had to pay due to Government taxes and other imposures. The Dong Yang plant could obtain tin ingots at a price of about 13,000 to 14,000 US $ per ton FOB.

There were diverging opinions as to whether a tinplate company should also establish its own can manufacture facilities. A tinplate producer with his own canning line would certainly add to his profit by producing added value products like cans. Other canmakers in the country may, however, be reluctant to buy tinplate from a company which is at the same time a competitor to them.

It was considered that the Indian situation was a very peculiar one and the production of tinplate was very expensive mainly because of the duties levied on imported FMBP coils. It was also pointed out that the galvanized sheets in India were sold at an even higher price than tinplate. The market

for tinplate was decreasing. Whilst many other countries used tinplate cans for packaging lubricants, plastic containers were used in India.

New market outlets and such competition would have to be taken in mind by countries going in for establishing new tinplate facilities.

It was agreed that locally produced tinplate in Pakistan would have to be sold at a higher price than imported ones, if the production costs were to be recovered. Again, the factor of self-sufficiency, saving of foreign exchange and creation of employment opportunity would be decisive in choosing local production vs. imports.

Again the question of process selection arose (Ferrostan versus Halogen) and various opinions were heard. No substantial differences in operation of the two processes were reported. The participants from Thailand and Republic of Korea referred to their positive experience with the Halogen line, mainly to its relatively easy maintenance. No production problems occured. It was noted that out of 129 tinplate plants presently in operation worldwide, 82 operated the Ferrostan process, 23 the Halogen process and 7 the alkaline process. It was noted that the Halogen process was also in operation in Malaysia.

## Establishment of a Tinplate Manufacturing Plant in Pakistan

By Mr. Tahir Abdullah Hussain, Consultant, ENCON Services, Industrial Engineering Consultants (Representing FECTO), Karachi

Paper previously presented at the National Seminar on Downstream Industries for Pakistan Steel.

### SUMMARY

The paper describes the electrolytic tinning line process. An annual growth rate of tinplate requirements of 8% is predicted. Based on this growth rate it would be expected that tinplate consumption by 1990 would be of the order of 117,500 tons and reach 254,000 tons by the year 2000. ENCON Services have designed a project for a 120,000 tpy of tinplate for the FECTO Group, based on the above market requirements. The situation of the Gulf area has also to be kept in view for export opportunities. The Gulf Organization for Industrial Consultancy has carried out market surveys into the future of steel industry in about 12 Arab states and these indicate that there would be a gap in sheet production and demand of 2.3 million tons in 1985, 4.4 million tons in 1990 and 6 million tons in 1996 and that 20-25% of this would be in the form of tinplate. Accordingly the forecast demand to be satisfied through imports into Arab countries would be 0.5 million tons in 1985 rising to 1.5 million tons in 1990.

The initially proposed 120,000 tons capacity could be expanded to 150,000 in the future. The following product mix proposed: 0.24 mm, 0.25 mm, 0.29 mm and 0.35 mm. Capability to produce 0.15 mm tinplate will be foreseen. To achieve the required output, 130,300 tons of blackplate would be required, a demand which is proposed to be met by a significant part from Pakistan Steel's cold rolled products. It is expected that the proposed plant would provide job opportunities for 40 technical staff, 38 administrative staff and a total of 218 people. Down-stream canning industries would also subsequently be established and substantial foreign exchange could be saved.

DISCUSSION

It was felt that the foreseen capacity was too high, particularly if one considered that other companies also tried to obtain licenses for the establishment of tinplate plants in Pakistan. It was questioned whether an assumed growth rate of 8% would be realistic in the long run. The market saturation level should also be taken into consideration when projecting consumption rates. If all 4 proposed companies would be set up, Pakistan would have a tinplate production capacity of 350,000 tons. If the Government sanctioned the establishment of 2 plants, these would have to share the market which expectedly would be around 80,000 ton per year by 1985.

It was noted that the proposed projects were still in the planning stage and that modifications could always be introduced, such as the installation of a first line with a 75,000 tpy capacity which could be expanded in a second stage to double its capacity. As production process, Ferrostan was in close consideration.

## Tinplate Production in Thailand

By Somchai Chittaprakorb, Thai Tinplate Mfg. Co. Ltd.

SUMMARY

Tinplate production in Thailand started in 1958 and up to now the Thai Tinplate Mfg. Co., has been the only production company in the country. Initially about 6,000 tons per year of hot dipped tinplate were produced. In 1963 production was expanded to 16,000 tpy. The main uses of tinplate were for milk and fruit canning and for 5-gallon kerosene drums. Initial problems mainly related to the lack of uniform coatings and were overcome with the help of the local governmental technological research institute and UNIDO and following the acceptance of the quality standards by the local canning industry, tinplate production spread rapidly both for home use and export. Expansion took place by installing a 60,000 tpy tinning line and production of hot dipped tinplate was phased out. Equipment for the production line was ordered from Kawasaki Steel Corp., Japan, and 12 Thai participants were trained at Chiba works for 6 months. The test run of the machinery took place in 1973. The investment was shared by some local investors (55%) and 4 large Japanese companies namely, Mitsui and Co., Kawasaki Steel, C.Itoh, Kawasho. With the expansion of the canned food industry, the demand for tinplate rose steadily and by 1980 it was decided to install a second production line with a total designed capacity of both tinplate and tin free steel plate of about 90,000 tons per year. The second line went into operation in 1982. In that year tinplate consumption in Thailand had risen to 105,993 tons, of which 64,882 (including TFS) were locally produced.

The advantage of this factory is its location, situated, as it is, on the bank of the canal, directly connected to the main river.

Imported tin mill black coils are transferred to a smaller barge and shipped to the factory, with minimum possibility of transit damage. With good packaging and perfect handling, transit defect is kept under 0.4%.

The tinplate market in Thailand can be divided into 2 parts: high quality tinplate (or prime) for canned food and special products (high quality paint, vegetable oil etc.) and the market for seconds, which is made up mostly of waste/waste tinplate imported at low price and used for many consumers products, particularly for dry contents e.g. biscuit cans. The production of prime quality totalled 76,831 tons in 1983 which were used for packaging as follows: for milk 21%, seafood 27%, pineapple 18% and other purposes 26%.

Having two comparative lines parallel in the same building, it was concluded that the new one with sophisticated computerized control could gain more advantage on less downtime, easy control of current supply to all functions and quick monitor of faults.

The quality control of the company's tinplate conform to ISO, TIS and JIS. Samples are taken for testing from the production line at least three times in an eight hour shift for tin coating and oil film checks. Dimension and shape are checked more frequently: about three times for every seven tons of coil.

Problems in the tinning process that were occasionally encountered were those of wood grain, improper oiling application and sheet bowness. After increasing tin coating weight, wood grain completely disappeared. As regards improper oiling application, installation of a chart recorder to check the function of the oiling system effectively minimized the problem.

DISCUSSION

It was questioned how the maintenance was organized and participants were informed that only one day in a month was provided due to the overwhelming demand for tinplate. With some break down, the production rate was in average about 87%. The Thai Tinplate Mfg. Co., employs 372 people, 204 of which work in the operation of the ETP/TFS plant. It was reported that shear blades when in use for cutting various gauges lasted for about 4,000 tons throughput.

Asked about the reason for selecting the Halogen process, the Thai participant felt that less maintenance wear occurred. The plating line was easy to maintain as it was horizontally arranged. Horizontal scrubbing is being used. In 1983, 95% of the produced tin sheet was of prime quality, 3.7% seconds and the rest waste/waste. The transit defects of coils are less than 0.4%.

The maximum stock capacity for the coils was reported to be 16,000 tons while shipping yard stock capacity was 13,000 tons. TMBP coils are mainly imported from Kawasaki Steel with some additional from Nippon steel.

The overhead costs of the plant were kept at an average of 8.1% of the production cost in 1983.

Problems with sheet bowness could be overcome by establishing 2 off-line levellers to provide flat sheets for the customer.

Concerning the usage of cans in the dairy industry, it was reported that in Thailand tinplate cans were not only used for milk powder and condensed milk but also for sterilized milk.

## Tinplate Production Activities of Eregli Iron and Steel Plant in Turkey

By Mr. Ismet Angan, Cold Mill and Finishing Lines Superintendent, ERDEMIR

### SUMMARY

Turkey has started the electrolytic tinplate production in 1965. In that year the plant produced 13,000 tpy which was gradually increased to 99,000 tons in 1983.

Major modifications took place in 1969 in order to satisfy the increasing demand for tinplate:

- with the addition of 2 more coating tanks the total number of plating passes was increased to 8 and the total current capacity was raised from 32,000 amps to 64,000 amps;
- one more pay-off reel was installed;
- shear, double pinch roll, electrolyte recirculating pumps and coolers as well as a storage tank were added.

The line speed could thus be increased. In order to eliminate the negative effects of sulfon (DDS) and ARFSKOP the system was changed from DDS to ENSA-6. As a result of this modification an increase in production and improvement of quality was made possible.

Main fields of application of tinplate in Turkey are as follows: container manufacturing (95%), vegetable and olive oil industry (22%), canning (cheese, sauce) (12%), bottle and jar closures (5.3%), mineral oil industry (4%).

Plans exist for establishing a new electrolytic tinning line with a capacity of 250,000 tpy. It will be designed to allow production of both sheet and coiled electrolytic tinplate as well as to run it as tin free steel line when desired.

### DISCUSSION

The presentation was well received. Participants were informed that all TMBP coils for tinplate production were supplied by the own steelworks of Eregli. The demand for tinplate in Turkey reportedly experienced continuous increase. In case of excess capacities exports will be envisaged.

Annex 1

# WORKSHOP ON TINPLATE PRODUCTION IN THE ASIA AND THE PACIFIC REGION

## LIST OF PARTICIPANTS

| COUNTRY | Name, position, address |
|---|---|
| Indonesia | Sugema<br>Chief of Sub-Directorate of Metal and Basic Products<br>Department of Industry<br>Gatot Subroto 52-53<br>Jakarta |
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| Rep. of Korea | Kyung Whan Lee<br>Managing Director<br>Dongyang Tinplate Ind. Co. Ltd.<br>240-24 Sungsan-Dong<br>Mapo-ku, Seoul |
| Pakistan | Tahir Abdullah Hussain<br>Consultant<br>ENCON Services<br>Industrial Engineering Consultants<br>Karachi |
| | Iqbal Ahmad Raza Kazi<br>Project Manager<br>OMEGA Tinplate Company<br>Abdullah Haroo Road<br>Karachi |
| Thailand | Somchai Chittaprakorb<br>Production Division Manager<br>Thai Tinplate Manufacturing Co.<br>33, Mu 13, Soi Salakbandh<br>Poochaosaminoprai Road<br>Prapradaeng, Samutprakarn |
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| Food and Agricultural Organization (FAO) | Colonel O.P. Kapur<br>FAO consultant<br>Head, Analytical Quality Control Lab.<br>CFTRI<br>Mysore, India |

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| UNIDO | B.R. Nijhawan<br>Senior Interregional Adviser<br>Division of Industrial Operations<br>P.O. Box 300<br>A-1400 Vienna, Austria |
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| | P.K. Banerjee<br>Manager, Quality Control<br>The Tinplate Company of India Ltd. |
| | S.K. Thakur<br>Manager, ETP/TFS Plant<br>The Tinplate Company of India Ltd. |
| | G. Senapati<br>Technical Assistant to Managing Director<br>The Tinplate Company of India Ltd. |
| | Piloo Katrak<br>Sales Manager<br>Zenith Tin Works Pvt. Ltd.<br>Opp. Race Course<br>Bombay 400 034 |
| | A.G. Srimankar<br>Executive, R and D Sciences<br>Metal Box India Ltd.<br>92/1, Alipore Road<br>Calcutta 700 029 |

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Annex II

## LIST OF PRESENTATIONS/PAPERS

| Title of paper | Author(s) |
|---|---|
| The status of tinplate/tinfree steel industry in India with special reference to products of the Tinplate Company of India Ltd., Jamshedpur, and the scope for co-operation between Asia and the Pacific region countries | R.K Bhasin<br>Managing Director, TCIL<br>and<br>G. Senapati<br>Technical Assistant<br>to Managing Director, TCIL |
| Experience of TCIL in tinplate production | P.K. Banerjee<br>Manager, Quality Control,<br>TCIL, and C.G. Gosh<br>Assistant. Manager<br>Quality Control, TCIL |
| Background of the project regarding the organization of a Workshop on Tinplate Production for countries of Asia and the Pacific | Colonel O.P. Kapur<br>FAO Consultant |
| Recovery and recycling of tin in tinplate plant | Dr. V.A. Altekar<br>Director, National<br>Metallurgical Laboratory,<br>Jamshedpur, India |
| The tinplate project in Indonesia | Sugema, Chief of<br>Sub-Directorate of Metal<br>and Basic Products,<br>Jakarta |
| Canning industry in Iran | Farid-Bassir Shabestari<br>Specialist in Metal<br>Industries<br>Ministry of Industry<br>Teheran |
| Tinplate production in the Republic of Korea | Kyung Whan Lee<br>Managing Director<br>Dong Yang Tinplate Ind.Co. |
| State-of-the-art of tinplate manufacture in Pakistan | Iqbal Ahmed Raza Kazi<br>Project Manager<br>OMEGA Tin Plate Co. Ltd.<br>(proposed), Karachi |
| Establishment of a tinplate manufacturing plant in Pakistan | Tahir Abdullah Hussain<br>Consultant<br>ENCON Services, Karachi |

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|---|---|
| Tinplate production in Thailand | Somchai Chittaprakorb<br>Production Division Manager<br>Thai Tinplate Mfg. Co. |
| Tinplate production activities of Eregli Iron and Steel Plant in Turkey | Ismet Angan, Cold Mill and Finishing Lines Superintendent, ERDEMIR |

Annex III

**WORKSHOP ON TINPLATE PRODUCTION IN THE ASIA AND THE PACIFIC REGION**
**Jamshedpur, India, 2 April - 6 April 1984**

## PROGRAMME OF THE WORKSHOP

2 April 1984

| | |
|---|---|
| 10.00 a.m. | Registration |
| 1.00 a.m. | Inauguration of the Workshop |
| | Welcome address by Mr. R.K. Bhasin, Managing Director, The Tinplate Company of India Ltd. (TCIL), Jamshedpur |
| | Inaugural address by Mr. Lovray Kumar, Secretary, Department of Steel and Mines, Government of India |
| | UNIDO welcome address by Dr. B.R. Nijhawan, Senior Interregional Adviser, Industrial Operations Division, UNIDO, Vienna |
| | Vote of thanks by Mr, Kumaraswamy, Chief of Quality Control, TCIL |
| 3.00 - 6.00 p.m. | Plant visit to The Tinplate Company of India Ltd. (electrolytic tinning line/ tin free steel plant) |

3 April 1984

| | |
|---|---|
| 10.00 a.m. | Technical Session I<br>State-of-the-art of tinplate production with particular reference to the Asia and the Pacific region countries |
| 3.00 - 5.00 p.m. | Technical Session II<br>Recovery and recycling of tin in tinplate plant |
| | Presentation by FAO consultant |

4 April 1984

| | |
|---|---|
| 10.00 a.m. | Technical Session III<br>Presentation by participants |
| 3.00 - 5.00 p.m. | Technical Session IV<br>Presentation by participants |

5 April 1984

| | |
|---|---|
| 8.00 a.m. | Plant visit to TELCO, Jamshedpur |
| 11.00 a.m. | Technical Session V<br>Presentation by participants |
| 3.00 p.m. | Plant visit: TISCO Works, Jamshedpur |
| 4.30 p.m. | Technical Session V (continued)<br>Presentation by participants |

6 April 1984

| | |
|---|---|
| Morning | Free<br>(possibilities for additional plant visits and/or excursions in and around Jamshedpur |
| 3.00 p.m. | Presentation and adoption of the Report of the Workshop<br>Conclusions and Recommendations |