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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANISATION

Technical assessment of some project-related information collected during the study tour by the Beijing Research Institute for Chemical Industry in the United Kingdom.

(DP/CPR/85/021)

A report for the Government

of

The Peoples Republic of China

by

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of the United Nations Industrial Development Organisation acting as the Executing Agency for the United Nations Development Programme.

A. SUMMARY

A study tour by six staff members of the Beijing Research Institute for Chemical industry has been undertaken in the United Kingdom, as part of a tour covering also visits to Germany and Italy. The purpose of the tour was to up-date technology relating to all aspects of rigid pvc processing and applications, and specifically to profile extrusion and processing, and manufacture of pvc window frames. Over a period of eight working days some six companies/institutions were visited in the UK as well as a large number of companies exhibiting at Interplas 85 (the international Plastics exhibition) in Birmingham. Arrangements have been made for both samples and technical literature to be sent to the Institute in Beijing so that comparative tests can be made with Chinese produced materials. A wide range of personal technical contacts were established. Some of the companies have indicated their willingness to consider licensing their technology. Potential training sources were also identified. An overall view of new technology developments has been presented.

B. INTRODUCTION

This mission of fifteen days covered preparatory work for the study tour and then acting as scientific & technical adviser to the tour group from the Beijing Research Institute for Chemical Industry, during their visits in the UK. On meeting the group at Interplas 85 in the National Exhibition Centre in Birmingham on Monday 16 September 85 the consultant was informed that the group planned to fly to Germany on Thursday 26 September as their first appointment there was scheduled for Friday 27 September. As the UK programme had been based on a departure from the UK on Sunday 29 September this necessitated a re-arrangement of the schedule. It was agreed to cancel the visit to Brunnel University and the factory visit to Betol Engineering Ltd in Luton. Visits to Yarsley Technical Centre in Redhill, and to Building Research Advisory Service (BRAS) & British Board of Agreement at Garston were therefore switched to Wednesday 25 September. Optimisation of these visits was accomplished by dividing the group into three teams of two. One team to visit HIS Systems Ltd in Crevedon and Tewkesbury, one team to BRAS and British Board of Agreement, while the third visited Yarsley Technical Centre in Redhill (with the consultant) The British Council were informed of these requested changes and they very kindly made the necessary contacts to re-schedule the visits and the hotel accomodation requirements. As Betol Engineering Ltd were exhibiting at Interplas 85 an appointment was made to visit their stand for discussions with their technical personnel.

Prior to the group arriving in the UK, LB Plastics Ltd, Derby, advised that they were cancelling the scheduled visit to their factory on Wednesday 18 September. An additional day was therefore scheduled to be spent at Interplas. Apart from the above changes the schedule as detailed in Annex A was undertaken.

C. FINDINGS

Interplas 85 incorporated over 1,200 exhibiting companies drawn from 25 different countries. The total amount of stand space odcupied was 43,000 square metres within six halls of the National Exhibition Centre. The size and scale of the exhibition was overwhelming for the group on the first day, but by dividing into smaller teams it was possible to make an improved utilisation of the time available. A large number of companies were visited and samples of raw materials and technical literature were arranged to be sent direct to the Institute in Beijing thus off-loading a weight problem from the luggage of the members of the study group. Technical contacts were established with a number of companies so that follow up action can be progressed after the group return to Beijing.

1. New technology

New technology is a relative term, but compared with 1982 the following comments can be made.

Visits to raw material supplies at the exhibition, and at factories showed that with regard to the commodity polymers (pvc, pe and ps) the research effort has been directed to improved safety in working conditions, and to achieving a greater degree of consistency of product quality. During the visit to ICI this was high-lighted when the group were informed that their current polymerisation technology had been up-graded so that no person now needs to enter a reaction vessel to clean the polymer that used to stick to the walls. This problem had been solved by their new polymerisation techniqe/technology so they no longer faced the problems. It was indicated that ICI would be prepared to consider licensing arrangements for the technology, and details will be sent to Madam Liang. The toxicity of vinyl chloride has made a reduction in the levels encountered during the manufacturing stage of pvc a high priority of research, and the new polymerisation technology is a result of that programme. The UK legal limit of vinyl chloride in pvc is 10 ppm, the ICI polymer is generally in the range of 5 ppm. For pvc rigid bottles for water they have developed a grade with only 1 ppm.

Stabilizer manufacturers have directed their research efforts to develop a technology to reduce the toxicity risks resulting from the handling of heavy metal complexes. The development of non-dusting physical forms of their stablizers, previously supplied as fine white powders, has now been achieved. They are now available in flakes or in fine needle-like forms. In addition some of the companies offered 'one pack' systems containing a total stabilizer/lubricant system formulation for a particular end-product, such as extruded profiles for window frames. This method reduces the inplant handling of the materials and eliminates the weighing operation that is normally necessary. Durham Chemicals Ltd indicated that they would be prepared to negogiate a technology licence if reque ted by the Institute.

The various displays at the exhibition indicated that further

progress has been made in reducing the manpower requirement in various stages of plastics processing.

The use of robots was demonstrated at injection moulding machines to remove items from the mould, transporting and in assembly operations. The robot units were of smaller size than previously seen and with much improved mechanical sensing.

Whilst 1982 was the year for the automation of the injection moulding operations 1985 saw several companies demonstrating automation of the extrusion process. Automatic thickness control for pipes using ultra-sonic sensors feeding signals into a computer programmed to react to thickness changes by either increasing the speed of the line or making relevant temperature adjustments. Inone case the extrusion die was mechanically adjusted automatically. For blown films, and T_die extrusion of sheet infra-red sensors for thickness control have been developed. Like the operation for pipesthe signals are fed into a computer pre-programmed to react to bring the thickness within the required limits of variation . In both types of system the signals are fed to a colour TV monitor and the variation can be seen as a coloured profile against the preferred set thickness. In addition temperatures and speed are all displayed. Thickness equipment costs ranged from £50,000 to £200,000.

Further advances of computer controlled testing equipment was demonstrated on several stands enabling, for example, the tensile strength or modulus of test specimensto be automatically calulated, analysising the result obtained and plotting the standard deviation .

Apart from some technical refinements there appeared to be no major changes in the equipment available for compounding plastics materials. For general compounding there is a choice of three types of equipment
Internal mixers (Banbury type)
Buss mixer (special type of single screw extruder with oscillating screw, and easy access barrel)
Twinscrew compounders

The choice of equipment depends much on the rangeof materials it is required to compound. The internal mixers can handle almost all types of materials but are extremely capital intensive. At the other end of the scaleare the twinscrew compounders which can handle reasonable loads such a rigid pvc compounding, but polymer alloys and glass filled thermoplastics etc would place an extremely heavy load on the machine for which it is really not designed to handle The cost is approximately half that of the internal mixer. The Buss mixer fits an intermediate position as also is its cost.

2. Visits to factories institutions

A wide range of technical questions were answered during the course of visits to both factories and to institutions. Excellent co operation from both the companies and the institutionswas shown to the group visiting.

At RAPRA the cavity transfer mixer (CTM) was described and shown. It is a device which can be fitted to an existing extruder and will significantly improve both the distributive and dispersion mixing of the material. Betol indicated a price of £3000-£3500 for a unit for a 45 mm extruder while Francis Shaw indicated a price of £8000-£10,000 for a unit for a 75 mm extruder. Much depends on the type of extruder.
The benefits of membership of RAPRA were outlined by the Director, Dr.J.Berry. This includes discounts on both its databank and consultancy services. It was indicated that the fee could be negogiated. Under the project this might well be a matter that could lead to an institutional linkage which would ensure continuity of technology up-dating after the completion of the project.

At Yarsley TechnicalCentre in Redhill a very wide range of specialised fire and flame testing equipment were seen and the methods described. Other testing equipment and processing items, extrusion, injection moulding etc were all shown. In response to questions Yarsley indicated that they were prepared to undertake specialised training programmes that would be tailored to the specific needs of the individual, and agreed in advance. RAPRA had also indicated that they would also be prepared toundertake training where the person would be fitted into a multidisicplinary team working on an on-going project. The person would receive practical experience in methods of setting up a project as well as being under personal supervision. A six month training programme was regarded as being of reasonable duration for the type of work which had been indicated.

The study tour group have established a wide range of contacts for future use both in the areas of raw materials and for processing and testing equipment. The exhibition justified the additional day that was spent there, and if the K86 (International Plastics exhibition) to be held November 6-13 1986 in Dusseldorf is also to be visited it should be remembered that it is roughlytwice the size and a full working week will be required (seven days) to gatner the type of information sought by the Institute. It is therefore proposed that consideration should be been to this matter and a decision made before the end of January 86 in order that accomodation can be booked in Dusseldorf. Applications after that date will generally find Düsseldorf full and accomodation will only be found in out-lying locations such a Cologne etc which all involve daily travel to and from the exhibition. A state of affairs that should be avoided by advance planning.

D. ACKNOWLEDGEMENTS

The consultant wishes to express his personal thanks to all his counterparts, Mdm Liang, Mdm Zhia, Mdm Ling, Mr Chen, Mr Yang and Mr Fang,whom he accompanied during their visits,for the enthusiasm, courtesy and very kind co-operation which was shown to him at all times.
Thanks are also expressed to Mr Saunders of the British Council for his very kind help, assistance and co-operation extended to the consultant, and for his speedy reaction to making re-schedule arrangements.
Finally, but not least, acknowledgement is made of the back up services provided by UNIDO, Vienna which enabled this tour to meet a very short arrangement period.

ANNEX A

Chinese Study Tour DP/CPR/85/021 12 Sept 85 Programme information

September 85

Sun 15 Group arrive Gatwick CA 937 09.20. Stay over Sunday night in London. British Council telexing details direct to Institute, Beijing.

Mon 16 Group travel from London Euston railway station to Birmingham International (station at exhibition from where taxi can be taken to hotel).

Euston 09.05 - 10.32 Birmingham International station
09.30 - 10.57
10.05 - 11.36
10.40 - 12.04
11.05 - 12.35
11.40 - 13.04

NOTE: Contact point for A D Clarke is British Plastics Federation stand in Hall 3, Stand 4C3.

Hotel is located on outskirts of Birmingham and only a few kilometre from Interplas exhibition.

Bridge House Hotel (booked for six nights)
49 Sherbourne Rd Tel:021-706-5900
Acocks Green.

British Plastics federation will be sending complimentary entrance tickets for Interplas. They will be available at London hotel on arrival Sunday 15 Sept.

Tues 17 Interplas

Wed 18 Interplas (please note L B Plastics have cancelled visit)

Thur 19 Train to Shrewsbury for visit to RAPRA Technology Ltd at Shawbury.

Birmingham International	dep. 8.50	Dr J Berry Managing Director
Birmingham New Street	arr. 9.07	Tel:0929-250 383
	dep 9.13	
Shrewsbury	arr 10.22	

RAPRA will arrange road transport from Shrewsbury station to Shawbury.

Fri 20 Interplas. (A D Clarke returns home to Sutton in afternoon)

Sat 21 REST DAY

Sun 22 Travel to Chester (A D Clarke will join group at hotel in Chester)

Birmingham New St	dep 12.08	OR		dep. 16.13
Wolverhampton	arr 12.27		Shrewsbury	arr 17.15
"	dep 13.00		"	dep 17.30
Chester	arr 15.02		Chester	arr 18.30

Riverside Pension Hotel (booked for two nights)
19 City Walls
Chester Tel: 0224-311498

Mon 23 Visit ICI in Runcorn (about 20 km from Chester). ICI will provide road transport from hotel to factory and return. Contact person Mr Godfrey Arnold. Tel: 0928-513351

Tues 24 Visit to Francis Shaw Ltd (machinery manufacturers for plastics) in Manchester. Depart Hotel. Francis Shaw will provide road transport to factory. A side visit to a local window frame fabricating factory maybe organised. Transport to Manchester railway station for journey to London. Contact person: Mr P Denis or M/s Mary Griffin Tel: 061-223-1313

Manchester 13.30 - 16.15 London Euston
15.00 - 17.43
16.05 - 18.44

Hotel in London booked five nights.

Regent Palace Hotel
12 Sherwood St
Picadilly, London W1 Tel: 01-734-7000

Computer registration numbers (all single rooms) 14581, 14585, 14586, 14589, 14592, 14596 and 14609.

Chinese Study Tour - continuation sheet

Wed 25 Visit H.I.S. Systems Ltd at Clevedon and Tewkesbury.
Depart Paddington railway station 08.00
Arrive Bristol (Parkway station) 09.10
HIS Systems will provide transport from station to Clevedon, and after discussions there then they will provide transport to see factory operation at Tewkesbury (about 80 km), and then return to Bristol Parkway station for return journey to London.
Contact person Mr Grayfield, managing director. Tel:0272-871271
Bristol 16.12 - 17.38 Paddington London
17.12 - 18.35

Thur 26 Visit to Betol Machinery Ltd. at Luton Contact person:
Depart London St Pancras station 09.18 MrR Pickard Managing Director
Arrive Leagrove station 09.52 Tel:0582-570501
Betol will provide transport from station to factory (about 3 km distance). Scheduled to depart factory at about 11.15 for journey to Watford (about 42 km) by road with transport provided by Betol Machinery Ltd.
Lunch in Watford
Taxi to Garston (about 5 km)
Building Research Advisory Service about 14.00 Contact person Dr Code.
when discussions completed then on to; Tel: 0923-676612
Agreement Building Board (probably 15.00 or 15.30) which is located on same site. Contact person: Mr Norman Garner.
Return to Watford by taxi.
Watford Junction station dep 16.37 - 16.58 Euston London
17.11 - 17.24

Fri 27 Visit Materials Technology Dept, Univerity of Brunnel, Uxbridge
Contact person: Professor M J Bevis. Tel: 0895-37188
Travel by London Underground railway to Uxbridge, about 30 minutes journey. Taxi to University (about 2 km). Visit scheduled to finish at 11.30. Return to London. Underground trains ('Tube') run about every 6 minutes.
Lunch when and where convenient.
Visit to Yarsley Technical Centre at Redhill. Contact person:
Victoria station 12.08 - 14.40 Redhill Mr M Dewey or
14.24 - 15.05 Mr B Trubshaw
Visit scheduled for about 15.00. Yarsley will provide transport from station to Centre and return to station. Tel:0737-65070
Redhill 16.55 - 17.24 Victoria
17.20 - 17.54
THIS COMPLETES THE UK SERIES OF VISITS

Sat 28 FREE in London. REST DAY.

Sun 29 Fly from Heathrow Airport to Frankfurt. Picadilly tube line runs direct from Picadilly to Heathrow (about 40 minutes journey). Trains about every 10 minutes.

Note: London railway stations, Euston, Paddington, Victoria are all within easy reach by tube from Piccadilly Circus tube station which is about 200 m from hotel.

Prepared by A D Clarke
12 Sept 85