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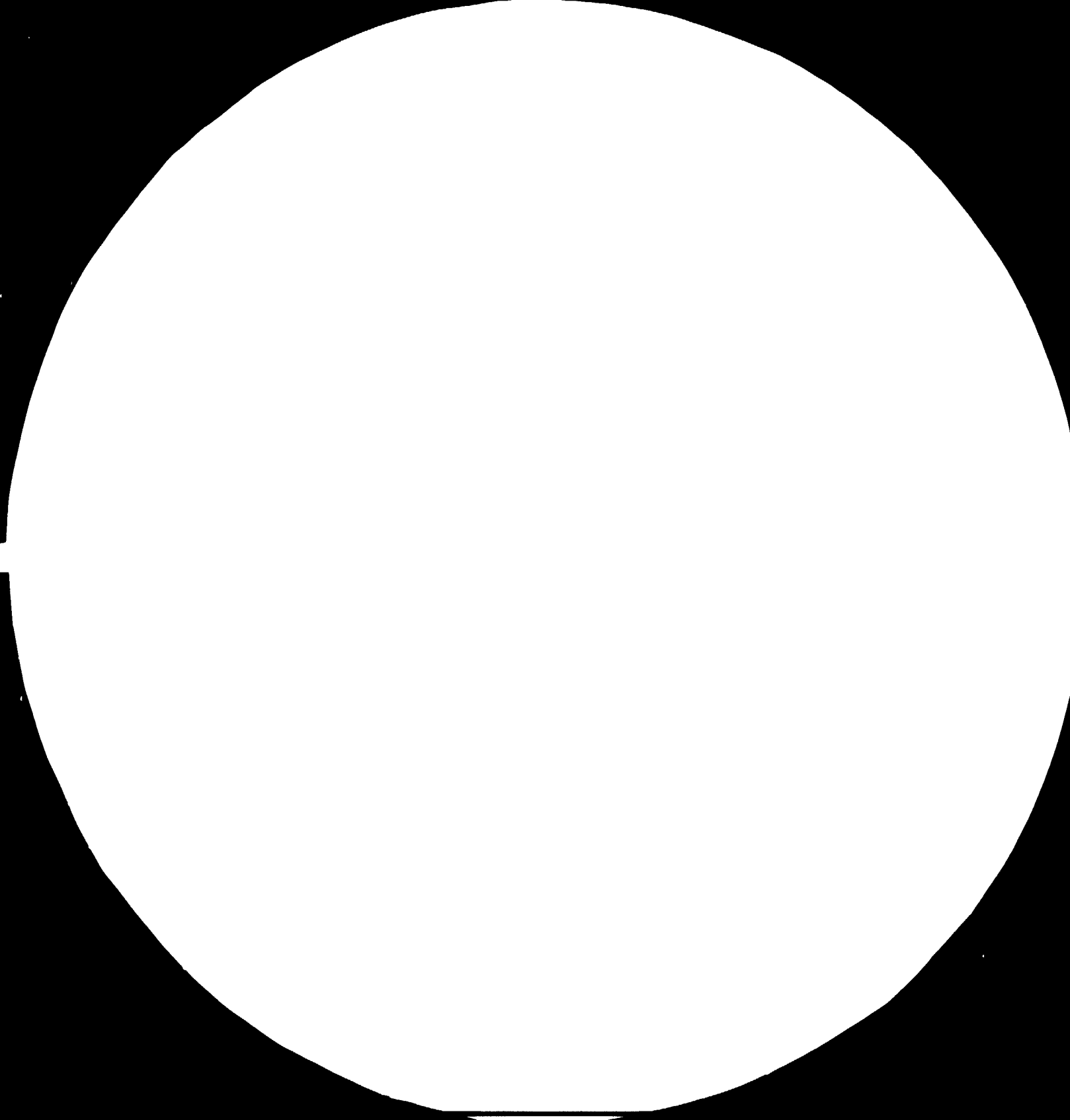
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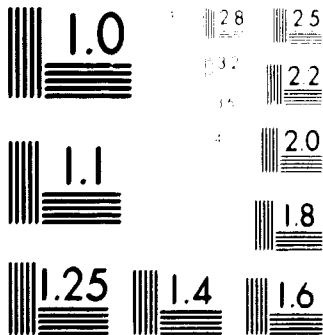
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MICROCOPY RESOLUTION TEST CHART

NATIONAL BUREAU OF STANDARDS-1963-A

BNF Metals technology Centre, UK

1983

FINAL REPORT

13060

on

UNIDO/BNF

Workshop on Energy Conservation
in the Metallurgical Industries.

UNIDO Project No. US/INT/81/040
UNIDO Contract No. 83/15

Prepared by:

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FINAL REPORT

on

UNIDO/BNF

Workshop on Energy Conservation
in the Metallurgical Industries.

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1. SYNOPSIS

This report deals with the proceedings of a workshop on energy conservation in the metallurgical industries organized jointly by the UNIDO Vienna International Centre and BNF Metals Technology Centre, Wantage, United Kingdom, held at BNF on the 16th-20th May 1983 for the benefit of participants from developing countries.

2. INTRODUCTION

The workshop planned jointly by UNIDO and BNF was intended to demonstrate to the representatives of developing countries methods which were being successfully used by BNF and by industrially developed nations generally to improve the efficient use of fuel in industry, particularly in the metallurgical industries, both non-ferrous and ferrous. The programme consisted of lectures and discussions, practical demonstrations of equipment and its use and visits to industrial companies in the metal industries. These activities are described in more detail later in this report.

3. PARTICIPANTS

Nineteen participants from eleven developing countries attended the workshop as listed in Appendix A. A representative from UNIDO's Metallurgical Section and a representative of the United Kingdom's Overseas Development Administration also attended during some of the lectures. (Appendix A).

4. LANGUAGE

The programme was conducted in English.

5. ORGANISATION OF THE WORKSHOP

The organising committee at BNF for the final planning and operating of the workshop was as follows:

- Dr. R.D. Johnston - Director-General, BNF
- Mr. D. Boxall - Group Manager, Technical Services, BNF. (Co-ordinator of the workshop)
- Mr. E.J. Bradbury - Commercial Director, BNF
- Mr. P.R. Francis - Financial Director, BNF
- Mr. R.C. Jones - Research Manager, Process Control & Instrumentation Division, BNF
- Mr. N. Whitter - Commercial Development Manager, BNF
- Mr. P.R. Clarke - Head of Energy Control Section, BNF

UNIDO Representation throughout the Workshop

- Mr. G. Komissarov - Industrial Development Officer, UNIDO
- Mrs. M. Maceljski - Industrial Energy Engineering Unit
UNIDO

6. PROGRAMME OF THE WORKSHOP

Part 1. Lectures

Eight lectures were given during the first two and a half days of the workshop. The first three reviewed BNF and UK Government work to assess the energy usage in sectors of industry and in individual companies for identifying the most effective measures to be taken to reduce energy consumption and described various schemes promoted by the UK Government to assist industry to make more efficient use of energy including Energy Audit and Thrift Schemes, Monitoring and Targetting Studies and Energy Conservation Demonstration Projects.

The other five papers presented described BNF work aimed at improving furnace design and performance, the application of automatic control of burners particularly by the use of microprocessors and the application of waste heat recovery systems.

A film entitled "The Efficient Use of Oil and Gas-Fired Furnaces" from the United Kingdom Department of Energy's Series on Managing Energy was also shown during the programme.

A list of papers and authors is given in Appendix B and brief synopses in Appendix C.

A set of printed copies of the eight papers was supplied to each delegate.

Part 2. Practical Demonstrations

On the afternoon of Wednesday 18th May control instruments and new materials for furnace construction were demonstrated.

A range of relevant products was exhibited by nine companies who sent experts to discuss the equipment in detail with the delegates. The majority of the instruments were also demonstrated in action in practical trials on furnaces operating in BNF's Technology Building. Details of the companies and the names of their staff who exhibited and demonstrated the equipment are given in Appendix D.

BNF also demonstrated some of its own monitoring and measuring equipment in action and mounted displays illustrating BNF research on gas flow modelling and applications of microprocessors.

The main types of equipment shown were as follows:-

Anacon Instruments Limited

Oxygen meters (zirconia type and Hersch type).

Furnace Controls Limited

Pressure measuring equipment

Hartman and Braun Limited

Gas analysing equipment (for CO₂ and O₂)

Kent Meters Limited

Oil flow monitoring equipment

Morganite Ceramic Fibres Limited

Low thermal mass fibre insulation

Shawcity Limited

Gas analysis instruments including chemical and portable flue gas analysers.

Smail, Sons & Company Limited

Orsat gas analysers

Taylor Instruments Limited

Portable oxygen meters

Wessex Power Technology Limited

Portable flue gas analysers

BNF Metals Technology Centre

Suction pyrometers, gas flow meters, thermocouples, portable gas analysing equipment.

BNF furnace monitoring and control trolley.

Gas flow models of reverberatory furnaces.

Applications of micro-processor control systems.

Part 3. Visits

A programme of industrial visits was arranged with the cooperation of several industrial companies. These visits allowed delegates to learn how managements in the companies were dealing with energy conservation matters and also gave them the opportunity to observe energy conservation measures being applied in practice. Two visits were made on the 19th May both in the Midlands to a foundry producing aluminium castings and to a large manufacturer of copper alloy rods and sections. The visit on the 20th was to a steel company located near Sheffield.

Visit 1.

D.S. Turner & Co. Limited
Western Way
Holyhead Road Industrial Estate
Wednesbury
West Midlands
WS10 7BZ, United Kingdom

Mr. G.L. Turner, Chairman and Managing Director.

At D.S. Turner and Company Limited the delegates were able to see the operation of a medium sized aluminium foundry producing sand and gravity die castings.

Mr. G.L. Turner gave a talk about the work of the company in reducing fuel usage in production and this was followed by guided tours round the works with opportunities to discuss the melting and holding furnaces being used. Of particular interest were the very good results achieved from the use of Morgan Bale-o-Matic high efficiency furnaces having specially developed annular recuperators and low thermal mass linings to increase efficiency. These furnaces were used for melting and holding. The delegates were also very interested in the high efficiency gas immersion-heated holding furnace designed and developed by BNF incorporation a recuperative gas burner developed by British Gas. This furnace was being used on production in the foundry as part of a Department of Energy's Demonstration Project.

Visit 2.

Delta Extruded Metals Company Limited
Greets Green Road
West Bromwich
West Midlands
United Kingdom

Mr. R. Foster, General Manager

The visit to this company enabled the delegates to see the way in which energy conservation matters were being treated

by a large company producing brass rod. A discussion group was arranged with Mr. Foster and his senior managers having responsibility for energy conservation. The firm's philosophy was to make all senior management responsible for energy reduction and to review energy usage and energy costs at frequent regular meetings.

The delegates were taken on guided tours round the works with special attention being given to the operation of melting, annealing and preheating furnaces. An interesting scheme developed by Delta to produce substantial savings was based on the circulation of warm air from such plant to heat other parts of the factory without the use of heat exchangers. The concept is described in the paper by J.W. Bassett referred to in the list of literature supplied to the delegates (Appendix E).

Visit 3.

Unbrako Steel Company Limited
Kiveton Park
Sheffield
SJ1 8PB, United Kingdom

Mr. A. Whitehead, Engineering Director

In this visit the delegates were shown the practical application of energy conservation measures in a fully integrated steelworks producing cold heading wire in alloy and carbon steel coils, hot rolled rod and alloy and high carbon steel billets. An account of the firms' activities and successful work on energy saving was given to the delegates by Mr. Whitehead and this was followed by guided tours round relevant parts of the factory. The firm received the Gas Energy Management Award in 1982 from the British Gas Corporation for its work leading to fuel savings of 13% or 460,000 therms a year.

The furnaces in which major improvements were achieved, shown to the delegates during the visit, were as follows:-

(a) Ingot reheating furnace.

Performance improved by the use of recuperative burners and the application of ceramic fibre tile linings.

(b) Billet reheating furnace.

Improvement in performance by the introduction of ceramic fibre lined recuperators for waste heat recovery from the fuel gases.

(c) Protective atmosphere coil annealing furnace.

Improvement by fitting recuperators to the radiant tube heaters.

7. POINTS AND RECOMMENDATIONS ARISING OUT OF DISCUSSIONS

Many of the questions which arose in the discussions after the papers and during visits were requests for clarification on particular points discussed or on the operation of plant displayed. However, there were some more major points arising out of the discussions which should be mentioned and these were as follows:-

There was a very clear requirement for and considerable interest in a greater application of energy conservation work in refining processes in the metallurgical industry.

Many delegates stressed the need for more trained technical support staff in their countries to ensure the satisfactory operation of equipment. Instrument suppliers were aware of the needs of developing countries and were anxious to supply control equipment and special materials to those countries. The instrument makers were developing robust instruments that were easy to operate and maintain and because of the increasing demand the price was becoming lower.

There was considerable interest in the work of the Energy Manager and a point which was stressed many times was that an Energy Manager must have the authority to make changes necessary and install the equipment required.

Some other points which were discussed in a group meeting of the delegates lead to the following recommendations for which there was unanimous support.

1. This workshop should be considered as a starting point for further development and activities. In view of the importance of cost benefits and energy saving, priority should be given in developing countries to national strategies aimed at developing and introducing programmes in the field of energy conservation in the metallurgical industries.
2. Developing countries may need to set up energy management establishments. People working on such programmes concerned with national efforts for economy in energy usage, and people working in such establishments should have sound industrial experience and knowledge.
3. Existing metallurgical industries in developing countries should be encouraged to make major efforts to improve energy efficiency.
4. From the experience of this workshop it is recommended that an extension workshop be held of longer duration with greater emphasis on practical demonstration and in-plant work with more case studies.
5. Developing countries should identify areas and projects where energy conservation in the metallurgical industries is required.

6. It is recommended that the prospect of a feasibility study relating to energy conservation in the metallurgical industries be examined and UNIDO's help be sought to carry this out.
7. Educational programmes aimed at top level management on the development of energy conservation should be considered.
8. It is recommended that British experience be made available when required.
9. Participants in this workshop should disseminate the information gained upward through their management and government agencies.

8. CONCLUSIONS

1. The workshop was successful in providing participants with a wide range of energy conservation techniques in metallurgical industries through a series of discussions and practical demonstration visits.
2. In many instances simple inexpensive programmes could be introduced which would result in more judicious and appropriate use of available energy resources. Particular note was taken of the role energy audits and industrial demonstration schemes could play and of the benefits that would accrue from the introduction of 'good housekeeping' programmes and from the use of control and measuring equipment.

9. APPENDICES

Appendix A.

UNIDO-BNF WORKSHOP ON ENERGY CONSERVATION
IN THE METALLURGICAL INDUSTRIES

DELEGATES

Dr. A.O. Del Campo	Project Heat at CIMM Extractive Metallurgy Division (CIMM is Centro de Investigacion Minera y Metalurgica, Casilla 170, Santiago 10, Chile
Mr. Z. Guoquan People's Republic of China	Research Metallurgist. General Research Institute of Non Ferrous Metals, Beijing, China
Mr. S. Daming People's Republic of China	Metallurgy Engineer. Energy Resources Research. General Research Institute of Mining and Metallurgy, Beijing, China
Mr. Z Shunying People's Republic of China	Senior Pyrometallurgical Engineer Central Engineering and Research Institute for Non Ferrous Metallurgical Industries, Beijing, China
Mr. S. Manor Menzo Ghana	Senior Chemical Engineer Gihoc Steelworks Company Ltd, Tema
Mr. C. Murphy Williams Guyana	Divisional Manager Planning and Development. Guyana National Engineering Corporation
Mr. S. Bhattacharyya India	Senior Executive Engineer (Fuel Technology) Hindustan Copper Limited 10 Camac Street, Calcutta
Mr. M. Jaiwant Deshmukh India	Senior Manager (Works) M/s Hindustan Zinc Limited PO Zinc Smelter Visakhapatnam, India
Mr. S.V.C. Agrawal India	Assistant Development Officer Government of India, Ministry of Industry D.G.T.D. (Directorate of General Technical Development).
Mr. R. Fasya Indonesia	Research and Development Institute for Engineering Materials Balai Besar Penelitian dan Pengembangan Industri Bahan dan Barang Teknik Jl Sangjuriang 14, Bandung

Mr. H.H.M. Piper Jamaica	Senior Research Scientist Scientific Research Council Kingston, Jamaica
Dr. J. Fonseca-Garcia Mexico	Director of the Centre of Investigation of Non Ferrous Metals and of Advanced Studies
Dr. J. Avila-Mendoza Mexico	Lecturer in metallurgy and corrosion. The Department of Metallurgy. Facultad de Quimica. Edificio D. U.M.A.M. Ciudad Universitaria 04510 Mexico
Mr. J. Picardo Martinez Peru	Chief of Metallurgical Division Minero Pero Unidad de Produccion Cerro Verde. Casilla 299 Arequipa, Peru
Miss M.N. Benites Regalade Peru	Adviser on energy conservation in the metal industries. Ministry of Engineering and Mines San Berja, Lima, Peru
Mr. B. Rayumbo Tanzania	Foundry Engineer Aluminium Africa Co. Limited Dar-es-salaam, Tanzania
Mr. V. Laswai Macatha Tanzania	Assistant Foundry Engineer Trainee National Engineering Co. Limited Dar-es-salaam, Tanzania
Mr. T. Sumpatchalit Thailand	Consulting Engineer Thailand Institute of Scientific and Technological Research Bangkok, Thailand
Dr. M. Valayapetre Thailand	Chief of the Non Ferrous Metals Smelting Section. Ministry of Industry, Bangkok, Thailand

The following were also present for some of the time during the Workshop.

Mr. G. Buckle	UNIDO Vienna Centre Metallurgical Section
Mr. J.D.L. Harrison	Advisor on Energy Overseas Development Administration United Kingdom

Appendix B

UNIDO/BNF WORKSHOP ON ENERGY CONSERVATION
IN THE METALLURGICAL INDUSTRIES

List of Papers

1. An Introduction to Energy Conservation in the Non Ferrous Industries
N. Whitter, CEng. MIMechE
BNF Metals Technology Centre
2. Energy Conservation in the Metals Sector
M. Gettings, BSc, PhD
Energy Technology Support Unit
3. An Industrial Energy Thrift Scheme in the Iron and Steel Industry
C. Hoskins, BSc, PhD
BNF Metals Technology Centre
4. BNF Developments Leading to Conservation of Energy in the Non Ferrous Metals Industries
R.C. Jones, BSc
BNF Metals Technology Centre
5. Practical Steps in the Improvement of Furnace Performance
P.R. Clarke, and B.K. Denton, BSc(Eng), PhD, ARSM, DIC
BNF Metals Technology Centre
6. Automatic Control and the Application of Microprocessors to Fuel Fired Furnaces
P.R. Clarke
BNF Metals Technology Centre
7. The Application of Waste Heat Recovery Systems
B.K. Denton, BSc(Eng), PhD, ARSM, DIC
BNF Metals Technology Centre
8. Some Aspects of Furnace Design
P.R. Clarke and B.K. Denton, BSc(Eng), PhD, ARSM, DIC
BNF Metals Technology Centre

Appendix C

UNIDO-BNF Workshop on Energy Conservation in
The Metallurgical Industries.

Synopses of the Papers.

Paper 1.

An Introduction to Energy Conservation in the Non-Ferrous
Metals Industries.

by N. Whitter.

The objectives, operation and value of an Industrial Energy Audit Scheme and an Industrial Energy Thrift Scheme are discussed as applied to the Non-Ferrous Metals Industries. The pattern of energy usage in these industries is outlined and the main measures being used successfully to reduce energy consumption and costs are described. Further developments are considered with emphasis on target setting and monitoring.

Paper 2.

Energy Conservation in the Metals Sector.

by M. Gettings.

A review is made of the work of the UK's Department of Energy and the Energy Technology Support Unit aimed at assisting industry to make more efficient use of energy. Various schemes have been devised by Government for this purpose including the Energy Audit and Thrift Schemes, Monitoring and Targetting Studies and Energy Conservation Demonstration Projects. The aims, operation, financing and current position of these schemes are described. The potential for improvement and the barriers to energy conservation innovation and how they may be overcome are discussed.

Paper 3.

An Industrial Energy Thrift Scheme in the Iron and Steel Industry.

by C. Hoskins.

The operation of the Industrial Energy Thrift Scheme in the U.K. Steel industry is helping companies to make better use of energy. The scheme initiated by the U.K.'s Department of Energy has as objectives:-

1. The gathering of information on existing patterns of energy usage in the manufacturing industry.
2. The promotion of more efficient use of energy in industry by improved processing efficiency and better housekeeping practice
3. The determination of energy saving opportunities and needs for further research and developments on energy utilization.

The scheme has identified significant opportunities for energy conservation. The paper describes the operation and benefits of the thrift scheme and a number of examples of the most effective energy conservation measures are discussed.

Paper 4.

BNF Developments Leading to Conservation of Energy in Non-Ferrous Metals Industries.

by R. C. Jones.

The growth of BNF's energy programme is described. A firm base established from research on mathematical and physical modelling of open flame furnaces led to improvements in many features of furnace design. Industrial consultancies and surveys showed where the needs for energy conservation were greatest and the potential savings likely to be achieved. The application of the knowledge has led to better heating methods and examples described include a highly efficient strand annealer for metal strip using convective heat transfer, gas fired immersion heating of molten metal and the better use of waste heat recovery systems. Some further BNF developments described provide more effective production routes and fuel savings.

Paper 5.

Practical Steps in the Improvements of Furnace Performance.

by P. R. Clarke and B. K. Denton.

Methods of improving the thermal performance of existing furnaces are considered. The theoretical aspects of fuel combustion, heat transfer from radiating sources and furnace control are discussed. The use of sample heat balances is discussed with examples of their use to identify major areas for improvements.

Equipment required to make measurements on industrial furnaces and the practical problems encountered when making measurements are illustrated. Information on commercially available equipment is given.

Paper 6.

Automatic Control and the Application of Microprocessors to Fuel Fired Furnaces.

by P. R. Clarke.

Automatic control of furnaces is proving a valuable means of ensuring fuel economy. The case for such control is considered and the benefits discussed. The general principles of furnace control by the application of microprocessors are explained. Experience with such systems is described particularly in controlling automatically the following processes:-

1. Copper melting and casting using a reverberatory furnace.
2. Copper melting, refining and casting using a rotary furnace.
3. Recovery of lead from scrap with a rotary furnace.

Paper 7.

The Application of Waste Heat Recovery Systems.

by B. K. Denton.

The benefits from using waste heat recovery systems are outlined and factors affecting costs and savings are discussed. Types of heat exchangers readily available are reviewed. Three case histories based on the use of three practical systems are described concerning the production of preheated combustion air, the recovery of heat for use in a high pressure hot water system and the development of a space heating scheme for a small foundry.

Paper 8.

Some Aspects of Furnace Design.

by P. R. Clarke and B. K. Denton.

The factors influencing operational efficiency of furnaces are considered. In some instances improved energy efficiency can only be achieved by the development of novel heating techniques in the form of new plant or by applying novel materials to existing furnaces. Descriptions are given of five practical examples of modifications to existing designs or the implementation of new concepts which have improved energy utilization in melting, holding and heat treatment furnaces in the non-ferrous industries.

General principles are developed for obtaining good design in furnaces with reduced energy costs.

APPENDIX D.

UNIDO/BNF Workshop on Energy Conservation

List of Companies exhibiting equipment on Wednesday (afternoon)
18th May 1983.

Anacon (Instruments) Limited St. Peters Road, Maidenhead, Berkshire, SL6 7QA.	Mr. T. Hooper.
Furnace Controls Limited, Beeching Road, Bexhill, East Sussex, TN39 3LJ.	Mr. D. J. Jones
Hartmann & Braun Limited, Moulten Park, Northampton.	Mr. J. Dines. Mr. B. Wainwright.
Kent Meters Limited, Pondwicks Road, Luton, Bedfordshire. LU1 3LJ.	Mr. P. E. Smyth
Morganite Ceramic Fibres Limited, Tebay Road, Bromborough, Wirral, Merseyside, L62 3PH.	Mr. A. Millwood.
Shawcity Limited, Units 12/13 Pioneer Road Faringdon, Oxfordshire. SN7 7BU.	Mr. P. Walton. Mr. D. Chapman.
Smail, Sons & Company Limited, 129 Whitefield Road, Glasgow, G51 2SF.	Mr. A. A. Ventura.
Servomex Limited Crowborough, East Sussex. TW6 3DU.	Mr. M. Sheppard. Mr. M. Welfare
Wessex Power Technology Limited, 540 Ashley Road, Parkstone, Poole, Dorset, BH14 OAE.	Mr. D. Southern. Mr. D. Milburn.

APPENDIX E.

Literature supplied to delegates attending the workshop:

Each delegate was provided with the following literature during the workshop.

1. One set of papers for the eight lectures as listed in Appendix B.
2. One Energy Conservation Information Pack issued by the United Kingdom's Department of Energy containing brochures, leaflets and booklets illustrating various Government schemes for promoting energy conservation. Some literature included was as follows:-
 1. Explanatory brochure on the Energy Conservation Projects scheme.
 2. A booklet from the series of Fuel Efficiency Booklets. A full list of the titles in the series is included.
 3. British guide to Government assistance in energy management.
 4. United Kingdom energy conservation policy - aide memoire.
 5. Leaflets on Energy Survey Scheme and extended surveys.
 6. An example of an Energy Audit Series Report covering a survey of energy conservation and utilisation in an industry.
 7. An example of an Industrial Energy Thrift Scheme report.
 8. Copy of Energy Management, a newspaper issued monthly on energy conservation matters.
 9. Brochures on energy conservation in private buildings.
 10. Leaflet. Check list for energy managers, fifty ways to use less energy.
 11. Managing energy. Leaflet describing fourteen training films on energy saving.

3. One pack of Guides to Energy Saving Products and Services available from British sources. These guides issued by the United Kingdom Department of Energy covering the following subjects.
 1. Buildings: heating and lighting economy
 2. Instrumentation and control
 3. Plant and process economy
 4. Waste heat recovery
 5. Consultancy
 6. Addendum 1982 to booklets 1-5.

4. One set of literature on BNF services and developments relevant to energy conservation.

5. Heating a Factory Building for Nearly Nothing.
J.W. Bassett, Energy World, No. 1982 pp 2-7.



UNIDO

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

VIENNA INTERNATIONAL CENTRE

P.O. BOX 300, A-1400 VIENNA, AUSTRIA

TELEPHONE 26 340 TELEGRAPHIC ADDRESS: UNIDO VIENNA TELEX: 136412

REFERENCE:

EVALUATION OF EX-PLANT GROUP TRAINING PROGRAMMES

Name of participant:

Home country:

Programme:

Host country:

Year:

I Pre-programme information

1. What is your opinion about the advance information on the programme received in your home country? (Please indicate with an X in the appropriate box).

	Sufficient	Too little	None
Aim of programme	16	3	-
Contents of programme	13	5	1
Level of programme	14	5	-

Do you think that additional information should have been provided? If so, please state your suggestions:

II Concept and organization of programme

2. What is your opinion about the contents of the programme?

appropriate

16

not appropriate

3

If not appropriate, please state why:

3. What is your opinion about the level of the programme?

too high 1

sufficient 13

too low -

4. Is, in your opinion, the programme:

too specialized 1

too broad (covering too many subjects) 5

correct in its concept 13

5. What is your opinion about the total duration of the programme?

much too short 2

too short 12

correct 5

too long -

much too long -

If too short or too long what should have been the duration?

2-4 weeks.

6. Do you consider the size of the total group of participants:

too large -

adequate 14

too small -

7. Give your opinion about the composition of the group of participants (homogeneity as to cultural background, profession, age, etc.).
Were there too many under-qualified or over-qualified participants?
Did you personally feel integrated in the group or, if not, why?

8. What is your opinion about the general character of the programme?
Should it, in your opinion, be:

More practical 13

more theoretical 4

as it is 1

9. How was, in your opinion a) the amount of practical training?

too much	<input type="checkbox"/>
adequate	<input checked="" type="checkbox"/>
too little	<input checked="" type="checkbox"/>

b) the amount of theoretical studies (lectures):

too many	<input type="checkbox"/>
adequate	<input checked="" type="checkbox"/>
too few	<input type="checkbox"/>

c) the number of study visits:

too many	<input type="checkbox"/>
adequate	<input checked="" type="checkbox"/>
too few	<input checked="" type="checkbox"/>

Please state your suggestions for changes, if any:

10. What is your opinion about the time allotted to language studies?

	absolutely indispensable	<input type="checkbox"/>
	useful	<input type="checkbox"/>
N.A.	unnecessary	<input type="checkbox"/>

Please indicate to what extent you could communicate with the personnel of the factories where you had your in-plant training:

11. What is your opinion about the training material used?

12. Did you have sufficient time for a professional exchange of views with instructors:

yes	<input checked="" type="checkbox"/>
no	<input type="checkbox"/>

with fellow participants:	yes	<input checked="" type="checkbox"/>
	no	<input type="checkbox"/>

with staff of the factories:	yes	<input checked="" type="checkbox"/>
	no	<input type="checkbox"/>

13. Did you benefit from that exchange

with instructors:	yes	14
	no	-
with fellow participants:	yes	18
	no	1
with staff of the factories	yes	18
	no	1

14. Did you feel that you could influence the programme content?

much	2
somewhat	5
little	12

III Relevance and applicability of the programme

15. Did you find the programme as conducted relevant to the conditions in your home country:

to some extent only	5
to a sufficient extent	8
to a great extent	5

16. Do you think this programme should be repeated?

yes	16	19
no	3	-

17. If yes, do you think it should be held

in the same country and place	7
in the same country but another place	-
in another developed country	12

Please state the reasons for your answer:

18. Do you feel that your participation in this programme has benefitted you professionally?

- to a very small extent
- to some extent
- to a sufficient extent
- to a high extent
- to a very great extent

19. Do you think that the qualifications you have acquired will be recognized in your home country?

- yes
- no

20. Will you have the opportunity to pass on the acquired knowledge in your home country?

- to a very great extent
- to a great extent
- to a certain extent
- to a limited extent
- to a very limited extent

21. How will the transfer of knowledge be made?

- a) during daily work with colleagues and personnel
- b) during meetings organized for this purpose in your company
- c) during meetings organized on a bigger scope

Are you of the opinion that you might encounter difficulties in passing on the knowledge obtained. If so, what are the problems you are anticipating?

22. Other suggestions:



