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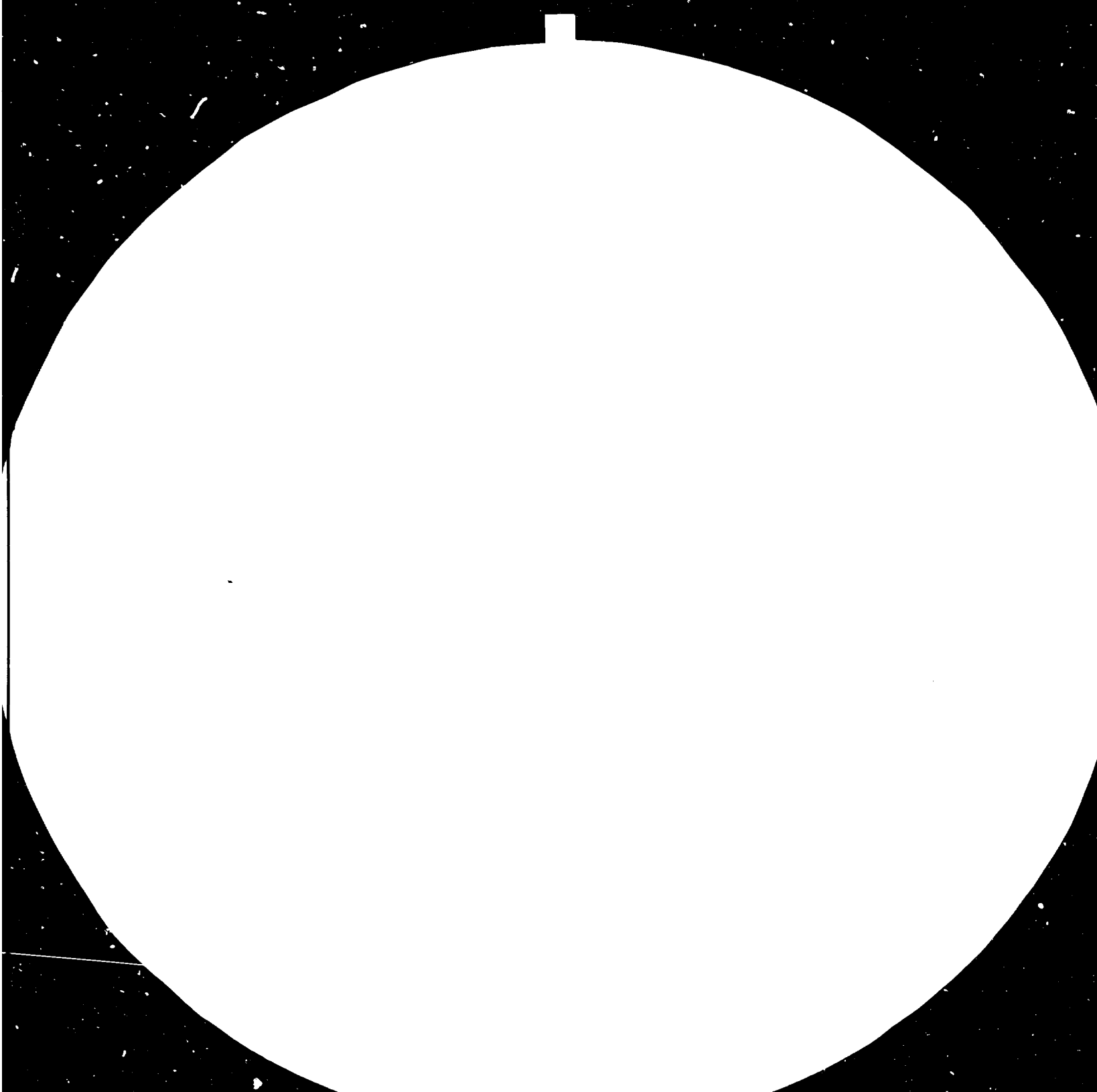
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INSTITUTE - INDUSTRY INTERACTION:
A COLLABORATIVE EFFORT IN PROBLEM SOLVING*.

by

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1.0 SCENARIO

1.1 State of Art:

The technological state of art decides the socio-economic scenario in a given country. The entrepreneurial adventures of private and Government undertakings, coupled with their urge for innovation, provides the appropriate technology and thrusts the country in forward direction in pursuit of the desired goals. Fortunately, the developing countries like ours are blessed with multiple abundant resources, be it oil, coal, minerals, food grains or manpower. And these need to be harnessed judiciously. Unfortunately, we have relied too heavily on either the aid programmes or collaborations with the multinationals. Inadequacy of suitable industrialisation in developing countries have been with regards to choice of technologies, assimilation and appropriate transfer of the alternatives. These impediments have been mainly due to the lack of comprehensive data base and developmental support at the national level.

1.2 Awareness:

Thanks to the organisations like UNDP/UNIDO etc., an awareness has been brought about amongst developing countries for integrated approach towards understanding the technology and the need for relevant R&D. The infrastructure at the national level is slowly being

built in different fields as felt essential in the changing environment. As a result of this, there have been now extended efforts being made to strengthen the existing infrastructure to adapt transferred know-how and to undertake R&D at regional as well as national levels. Birth of this Research Institute has been result of such concentrated efforts from UNDP/UNIDO/Government of India and BHEL.

2.0 WRI, INDIA AND IT'S INTERACTION WITH INDUSTRIES

It is in this context that the anatomical study of the interaction of this Institute with various user industries could be a pathfinder for the future. The investment potential of such an Institute is assuredly minimum and the success of not only any R&D organisation but for that matter any R&D project depends by far on its potential for true commercialisation. Necessity is the mother of invention and conversely, invention should cater to the necessity. For any country, logically appropriate R&D is the means and industrialisation is the end. This being the guiding principle, the basic philosophy of the Institute, has been to create and establish close linkages with the industries. With this as a base, the Institute has been establishing strong bond with the industries mainly through three channels -

- 1) Education;
- 2) Information dissemination; and
- 3) Consultancy - so as to upgrade the technology.

2.1 Education and Knowledge Dissemination:

Trained and well informed manpower provides solid foundation for efficient implementation and adaptation of newer technologies. To achieve this, around 500 odd individuals/industries have been on the mailing list of the Institute's Keywords Journal thereby establishing strong communication channels and School of Welding has been established where annually, passing out of another 400 odd technical personnel has laid the bridge to cross over for the consultancy requirements of the needy industries.

2.2 Consultancy:

For the developing countries where the industrial frame work has been built around the borrowed technology from advanced countries, the need for on-the-spot consultancy for trouble shooting, conversion of technology to suit the changing environment and development of suitable techniques, is very high. Lack of such developmental support leads to heavy dependance on the advanced countries and bites into meagre foreign exchange. Sensing this requirement and after an extensive market survey, the Institute with liberal technical assistance from UNDP/UNIDO has equipped itself with extensive supporting facilities including those for metallurgical investigation. To enable the Institute to render assistance to varied cross section of industries, systematic training inputs have been given to the Scientists/Engineers of the Institute in diversified fields such

as fracture mechanics, welding metallurgy, failure investigation, modern welding processes, consumable development, instrumentation, etc.

2.3 Problem Solving - A Collaborative Effort:

2.3.1 Shop floor Consultancy:

The problem solving for the needy industries has been a collaborative effort ranging from few days to months. The Institute has not only been rendering its assistance on a need base but also has been acting as a feeder conduit to starving and needy industries. The Institute's approach towards problem solving has been broadbased which caters not only to the needs for mechanical testing of small scale industries but also to the elaborate weldability investigations of newly developed steels by steel producers of the country. The Institute has been trouble shooting problems of fire fighting nature for various industries on an urgent basis and at the same time extends its services to undertake long duration projects of national importance such as indigenous development of welding consumables. Such and further projects in the areas of procedure establishment, quality and productivity studies in large fabrication industries, design and distortion control, techno-economic studies and appropriate choice of technology, etc., are carried out at the specific request of the customers on top priority.

2.3.2 Commercialisation of R&D Efforts:

Extensive efforts are simultaneously directed towards identification of newer areas in the national context by undertaking discussions with prospective customers, market survey, etc. The Institute undertakes such projects on its own as an investment for the future and after successful completion of these projects, they are implemented on trial basis, for the field feed-back, in the needy industries. Based on the feedback from the customers, further modification is done to perfect the system for use in the industrial environment. This approach of the Institute to pre-empt the situation, has resulted in successful commercialisation of R&D projects such as Pulsed Welding Module, Hot Wire Systems, Resistance Welding Instrumentation, Hard Facing Consumables, etc. As a result of this successful commercialisation the Institute has also now transferred the technology for the commercial manufacture of Pulsed Welding Module to a leading equipment manufacturer in the country, for example. The pragmatic outlook of the Institute in undertaking such high risk projects has had a snow balling effect in the Indian Industries wherein existing commercial manufacturers who had hitherto shunned away from development, probably have ventured into these newer areas and are now capable of providing the Indian industry indigenous technology at a lower cost and also effecting savings in foreign exchange.

2.3.3 Let's Come Closer:

"All's Well, that Ends Welded" - is the Institute's motto and to further the national cause for which

the Institute has been set up, an extensive effort has been made to get closer to the industries. Twice during past 4 years, consulting engineers from the Institute visited around 125 small and large industries and presented a slide show to apprise them about the capabilities and facilities of the Institute. On similar lines, technical personnel from the Institute visited around 150 Sugar Mills to apprise them about the latest consumable developments completed at the Institute for application in Sugar Mills. The response from the industries have been constructive and such visits and discussions have provided the Institute with the direction for the conduct of research in relevant areas of application.

2.4 Project Consultancy:

Hand-in-glove with this shop floor consultancy, the Institute has successfully provided number of Organisations with the project consultancy. Assistance has been sought from the Institute by various large and small Organisations in preparation of project reports, selection of suitable equipment and implementation of the entire project on turnkey basis not only for the manufacturing plants, but also for the establishment of full-fledged training centres for personnel in the field of welding. With the experience gained during handling of such projects and also during the 1st and 2nd phase implementation of our Institute, the Institute is now capable of extending its services to other developing countries. It would not be out of place to mention that with

growing need for industrialisation it would be necessary for developing countries like ours to build their own infrastructure to cater to our specific needs. Such infrastructural build-up in the field of welding for either one or group of developing countries could be on varying lines. To enable the delegates and to give our sister countries possible establishment of supporting infrastructure, a brief outline of model UNDP* project proposals is given in Annexure I and II. Annexure I touches upon a centre for Training, Testing and Documentation in welding whereas Annexure II dwells on the establishment of a Welding Research Institute. The essential difference in both these proposals has been brought about by the fact that the first model would be suitable for countries lacking any infrastructure in welding technology and the scope could be further expanded to become a full fledged Research Institute after successful implementation. WRI would be extremely glad to share its experiences with the developing countries in associating themselves in the preparation of Detailed Project Reports and also in the eventual implementation of the entire project based on requests through UNDP preferably or directly, if needed.

* UNDP = United Nations Development Programme, which, through its executing agency, UNIDO, may consider provision of technical assistance to those developing countries wishing to establish a Welding Research Institute, provided that the Government of the respective country submits an official request for such assistance.

PROJECT DOCUMENT

PRIMARY FUNCTION : DIRECT SUPPORT

SECONDARY FUNCTION : INSTITUTION BUILDING

GOVERNMENT INPUTS : US \$ 2,975,000
(IN EQUIVALENT CURRENCY) (CAPITAL INVESTMENT
= US \$ 2,325,000)

UNDP/UNIDO INPUTS : US \$ 1,812,500

DURATION : 2 YEARS

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PROPOSAL FOR ESTABLISHMENT OF A WELDING INSTITUTE FOR TRAINING
TESTING AND DOCUMENTATION

1.0 THE PROJECT

1.1 Development Objective:

The aim of the Institute would be to make available trained manpower and offer testing services for the country in the field of welding technology. The Institute would also act as knowledge dissemination centre.

1.2 Immediate Objective:

- A) To establish the Institute to cater to the total requirement of trained manpower for the country in welding.
- B) To equip the Institute with adequate facilities for training and demonstration to the practising technicians and supervisors in welding.
- C) To equip the Institute with testing and inspection equipment to offer testing services with a view to improve the quality of the products produced in the country.
- D) To train the country's personnel in other UNDP/ UNIDO assisted projects, and other institutions to initiate them to adopt practices followed elsewhere in the field of training, testing and documentation.
- E) To provide advice and guidance to the country's personnel in the relevant activities by invitation of experts from UNIDO projects and outside to render specialized advice for the job training and offer help in the initial stages.

- F) To devise training programmes for technical personnel in industries in appropriate fields of welding technology.
- G) To stimulate a wider understanding of the technology of welding in the engineering industries by organizing workshops, conferences; to disseminate the welding information available elsewhere for the benefit of industries.
- H) To develop a liaison with a similar body engrossed in training, testing and documentation activities.

1.3 Background and Justification:

Every country strives to achieve two basic needs - economic self-reliance and freedom from wants. These two strategic needs form the basis for the country's basic plans and these call for higher skilled labour availability and higher industrialisation. Action plans to achieve the above would need priorities to be given to appropriate core sectors like Power, Agriculture, Cement, Steel, Engineering, Petro-chemicals, etc. All the above examples of sectors need a basic strength and support in the field of welding through training, testing and documentation activities.

1.3.01 Engineering Industry and its Technological Aspects:

Engineering industry in the years to come, has a vital role to play if the country's plans in some or all the sectors mentioned above are to be fulfilled. In this context, the policy of transfer of technology from developed countries to the developing countries

must be viewed critically. The lack of relevance of the advanced country's technology to the developing countries can sometimes prove to be detrimental. This is because the industrial technologies in the developed world have a pronounced sophistication and labour-saving bias and consequently inappropriate in a developing country where capital is scarce and labour relatively abundant. Further, the material/wage ratio is very high in a developing country while it is low in the technologically advanced countries. The choice of technology is, of course, not always a matter of technology alone. Where the choice is purely a technological one, much support is needed to adopt foreign technology to the needs of the developing countries.

It is, therefore, imperative that a developing country should have an indigenous science and technology capacity of its own. Without it, and particularly without trained personnel, a developing country will not be able to know the existence of useful technology elsewhere, to understand, to adapt, to absorb, to repair, to maintain and to operate. At best, only in terms of short periods can these tasks be performed from the outside. In addition, the terms and conditions under which foreign technology is available to a recipient country depend upon its own scientific and technological capacity. In the absence of such a capacity, the developing country is placed in a perpetual posture upon the suppliers of technology. Where it may not be in absolute blankness, it would be necessary to widen the base progressively to enable absorption and progress on the appropriate technologies.

1.3.02 Engineering Industry and Welding:

In the Engineering industry, welding has come to play a major role in fabrication in a large number of fields be it a chemical, fertilizer, automobile, power generat oil, aircraft, space, electronics, etc., and also has revolutionised the development of joining process. In a developing country and with ever-expanding field of application of welding, a higher percentage of growth can be expected in the field of metal joining. The demands of the joining material has a direct bearing on the steel consumed in a country. Therefore, the welding fabrication industry would have to look forward to a period of steady expansion not merely in quantitative terms but also in terms of new types of fabrication involving special steels, stainless steels and various metals and alloys. The necessity of testing capability development goes directly with the fabrication development.

1.3.03 Present State of Welding Technology:

Among the welding processes available today, Manual Metal Arc Welding accounts for nearly 98-99%, in developing countries whereas in countries like USSR, USA, FRG, Japan, etc., this percentage does not exceed beyond 70%. Though one of the major contributing factors to this situation seems to be the fact that most of the developments abroad are pointed towards labour saving devices, one cannot overlook the fact that the products produced in those countries are capable of giving higher quality and service. In a number of welding applications, the ratio of material to wage is as high as 5 to 1 in developing countries or even more,

compared to 0.3 to 1 in developed countries. Thus a development effort in a developing country would have to be oriented towards material saving devices in addition to adopting the sophisticated methods developed in the world today. Even though the problems of this kind are supposed to be tackled by the existing industries themselves, their efforts are dictated by their own limited training, development and testing facilities, existing expertise and the urgency.

In the field of welding, education and testing is far from satisfactory in the developing countries due to absence of a specialised central infrastructure. The specialised training of the country's requirement is being provided by industries, at a huge cost by sending them outside. Further, the quality of the training provided must be made suitable to the specific conditions suiting the local conditions. The need to update the existing processes to maintain a progressive growth rate calls for documentation of knowledge to be disseminated to all industries from a central source.

In view of the above, there is a strong need for an infrastructure to be created in the developing countries for training, testing and documentation activities in the field of welding to start with.

1.4 Output:

A Training	15 months from starting date
B Testing	15 months from starting date
C Documentation	12 months from starting date

The project activities will result in the Institute

catering to industries in the following fields:

A) Training:

Following training programmes planned per annum:

Title	No. of programs	Duration (Weeks)	No. of persons to be Trained
Basic Welding Technology for Supervisors	4	6	60
Basic training and certification for welding skills	4	24	100
Advanced training and certifications for welding skills	Continuous	16	100
Special programs for Supervisors	8	2	80
Package programs for industries - tailor-made for conduct at Institute or outside	4	1	40
Seminar on welding processes, training, testing and documentation	1	2	For all the industries

B) Testing:

1. Destructive testing services
2. Non-destructive testing services

C) Documentation:

1. Dissemination of technical information through abstract service based on request.
2. Distribution of abstract bulletins on developments elsewhere.
3. Hardcopy services for technical articles.

1.5 Framework for effective participation of National and International Staff in the Project:

The activities necessary to produce the indicated output and achieve immediate activities of the project will be carried out jointly by the National and International Staff assigned to it. The respective roles of the National and International Staff will be determined by their leaders, by mutual discussion and agreement, at the beginning of the project and set out in a framework for effective participation of National and International Staff in the project. The framework will be reviewed from time to time. The respective roles shall be in accordance with the established concept and specific purposes of technical cooperation.

1.6 Development Support:

A National Seminar is proposed for organisation, to publicise the activities of the project, to encourage positive participation of various welding and fabrication industries in the activities of the project, and to utilise the presence of International Staff of the project. This would enable the Institute to formulate need-based developmental plans that would

ensure an effective contribution to the industrial growth.

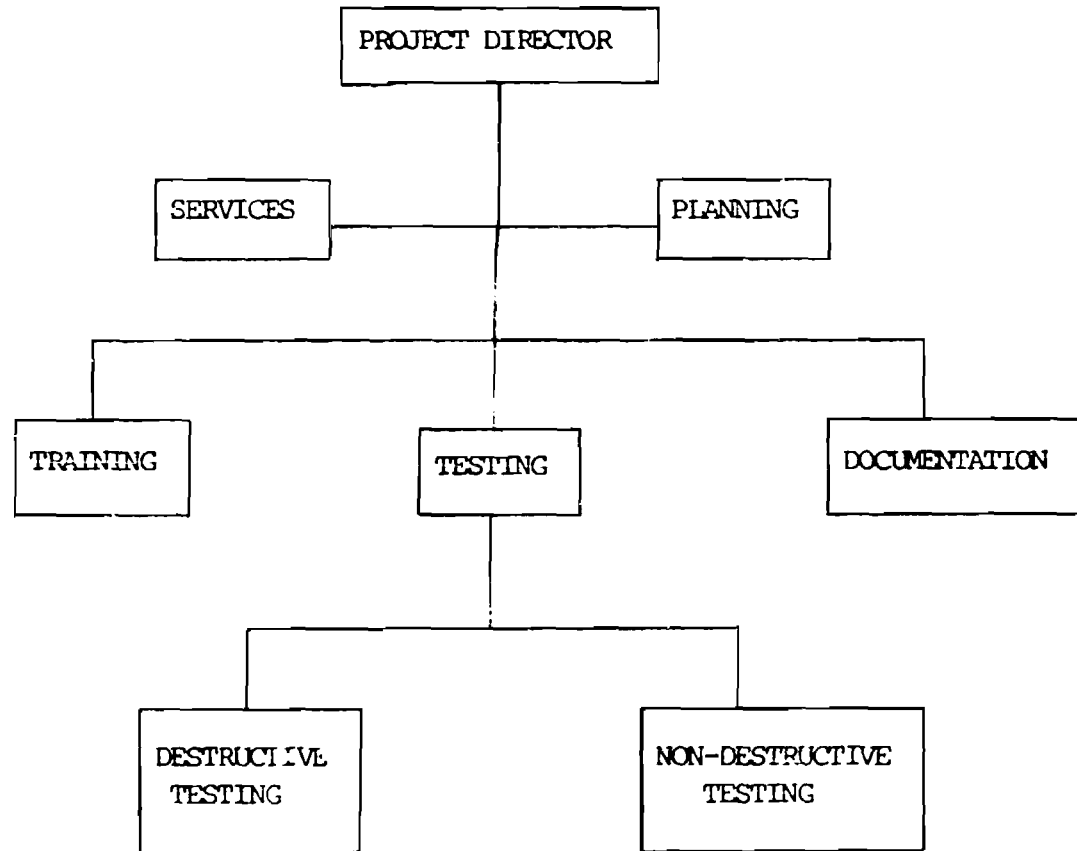
1.7 Institutional Framework:

The project proposed for its continued and ideal contribution to the industries should preferably be attached to the Government Sector and further to a fabrication industry being run successfully under the Governmental guidelines. The main reasons for the proposed set-up are -

- * The Institute would utilise the infrastructural facilities already available with the industry in the form of trained manpower, land, water, communication and other supporting facilities;
- * The Institute would not have any disparity in the working conditions compared to that of the industry to enable a sustained growth and contribution of the Institute to the industries;
- * The industry itself would be a great beneficiary of the Institute;
- * The forward linkages of the industry would very well be utilised by the Institute;
- * The running expenditure and corresponding service charges of the Institute would be lesser due to utilisation of support services from the industry;
- * The industry would be prepared for supporting the Institute out of its internal resources;
- * The services from the Institute would be production oriented;
- * The Institute would cater to need-based requirements of the industry.

The Institute would have an Advisory Committee consisting of representatives from Government Departments concerned and user industries to derive their support and participation in the activities of the Institute in order to maintain a high level of interaction for filling up the gaps identified. The Committee would also advise the Institute on the current and future activities of the Institute.

Internal Organisation Schedule of the Welding Institute



1.8 Prior Obligations and Pre-requisites:

The necessary land for the Institute and other supporting facilities should be made available for setting up the

Institute quickly. The Government would authorise an expenditure equivalent to US \$ 2,325,000 for capital investment and US \$ 650,000 for staff salaries and other miscellaneous expenses.

1.9 Future UNDP/UNIDO Assistance:

Following the final UNDP/UNIDO/Government review of the project, further upgradation of the project in carrying out Research and Development work on welding processes and technology would be decided through assistance from UNDP/UNIDO.

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ANNEXURE II

PROJECT DOCUMENT

PRIMARY FUNCTION : DIRECT SUPPORT

SECONDARY FUNCTION : INSTITUTION BUILDING

GOVERNMENT INPUTS : US \$ 8,693,800
(In equivalent (Capital Investment = UG \$ 5,825,000)
currency)

UNDP/UNIDO INPUTS : US \$ 3,908,800

DURATION : THREE YEARS

PROPOSAL FOR ESTABLISHMENT OF A WELDING RESEARCH INSTITUTE

1.0 THE PROJECT

1.1 Development Objective:

- A) To enable the Engineering and Welding Industries to catch up with the advanced countries in the use of modern welding equipment for production of quality products;
- B) To enable achieve self-reliance and self-sufficiency in the field of welding technology;
- C) To enable direct support to the core industries as well as small-scale industries by taking up applied research projects, offering consultancy and Quality Control services besides providing trained manpower in welding at all levels; and
- D) To enable dissemination of knowledge.

1.2 Immediate Objective:

- A) To establish and set up the Welding Research Institute to solve the practical problems of the fabrication and welding industry;
- B) To equip the Institute with most of the modern and sophisticated welding equipment both for training and demonstration to the practising technicians in welding and for developing and adopting newer technologies in the country;
- C) To equip the Institute with advanced testing and inspection equipment to initiate quality control services with a view to improve the quality of the products produced in the country and establish a good reputation for the welded fabrication industry abroad;

- D) To train welding personnel of the country at various levels abroad in order to initiate them to adopt newer techniques and processes and develop them further;
- E) To provide advice and guidance to the personnel at the Institute through deployment of experts from renowned institutions outside;
- F) To devise training programmes for technical personnel in industry at various levels in different fields of welding technology;
- G) To stimulate a wider understanding of the subject in the engineering industries through organisation of seminars, conferences and workshops; and
- H) To disseminate the welding knowledge available elsewhere in the world for the benefit of industries either to solve their existing problems or to upgrade their existing quality levels.

1.3 Background and Justification:

The basic needs of self-reliance and equality to the extent possible are the normal aims of any country's plan for development. This would call for a higher growth plan in all sectors of economy. In order to sustain the outside influences in a country and also to maintain an adequate growth rate, the industrial base has not only to be strengthened but also be enriched to enable greater increase in exports as well.

1.3.01 Industry and its Technological Aspects:

Engineering industry has a vital role to play in order to fulfill the country's plans. In this context, the policy of transfer of technology from

the developed countries to the developing countries must be viewed critically. The lack of relevance of the advanced technology to the developing countries, can sometimes prove to be detrimental. This is because, the industrial technologies in the developed world have a pronounced labor-saving bias and consequently inappropriate in a developing country where capital is difficult to obtain and the labor is relatively abundant. The material to wage ratio is very high in the developing country whereas it is low in the technologically advanced countries. The question of the choice and appropriateness of technology available from the developed countries is thus becoming a major issue even if the country has abundant potential of raw materials. The choice of technology is not always a matter of technology alone. When the choice is based on technology much research is needed to adapt foreign technology to the needs of developing countries.

It becomes imperative, therefore, that a developing country should have an indigenous science and technology capacity on its own. Without it, and particularly without trained personnel, a developing country will not be able to know what useful technology exists elsewhere and to understand, select, adapt, absorb, repair, maintain and operate the technology. At best, only in short term can these tasks be performed from the outside. In addition, the terms and conditions under which foreign technology is available to a recipient country depend upon its own Scientific and Technological capacity. In the absence of this, a developing country is placed in a posture of perpetual dependence on the suppliers of technology. Although,

this is true of the majority of the developing countries, it depends upon the position on a case to case basis.

1.3.02 Engineering Industry and Welding:

In the engineering industry, welding has come to play a major role in that, it is used in the fields of transportation, power generation, petro-chemicals, automobiles, aircraft, space, electronics and so on. With the ever-expanding fields of welding applications, a higher growth rate can be expected in this field in future in all developing countries. The demand of welding consumables has a direct bearing on the quantum of steel used in a country. With the increasing activities in industrialisation, there is no doubt that the welding industry would have to look forward to a period of accelerated expansion not merely in quantitative terms but also in terms of new types of fabrication involving stainless steels, special steels non-ferrous materials, etc.

1.3.03 Present State of Welding Technology and Climate for Research and Development:

Though welding may be used in various fabrication industries through collaborative means, there may not be a progressive implementation of quality bearing methods that find wide application in the advanced countries. This conclusion could be surmised from the fact that among the welding processes available today, Manual Metal Arc Welding using coated stick electrodes account for more than 98-99% of the total weld metal deposited in developing countries compared to countries like USSR, USA, FRG, Japan, etc., where this ratio does not exceed 70%. Unless speedier

steps are taken for the welding development in the developing countries, this ratio of 98-99% may not reach even 90% even in the next ten years. Thus the lag of the developing countries can be seen very clearly. One of the major contributing factors to this situation seems to be the fact that most of the developments abroad are pointed towards labor-saving devices and are capital intensive. Since in a developing country, capital may be scarce and labor relatively cheap, these devices may not be effective. In contrast to the advanced countries, the material to wage ratio is very high in developing countries.

In a number of welding applications, this ratio is as high as 5 to 1 compared to 0.3 to 1 in advanced countries. Thus the Research and Development effort in a developing country would have to be oriented towards material saving devices in addition to adopting the sophisticated methods developed in the world today for higher quality and productivity achievement. Although the problems of this kind are being tackled by the industries in isolation, but the results of even these few cases are not available to the other industries due to absence of a centralised R&D infrastructure in the field. Further, the R&D effort of these few industries is dictated by their limited facilities, the existing expertise and urgency. More often than not, the industries succumb themselves to the fact of living with the problems or to seek collaborative means to solve them.

The rapid growth of welding technology and the increasing role played by it on the industrialisation of the developing country brings along its stride a number of problems which require immediate attention. They are

the availability of indigenous capacity for all types of welding machinery, the required welding consumables for manual and mechanised welding processes, trained welding personnel from engineers to welders and the corresponding Destructive and Non-destructive testing expertise and facilities.

In view of the above problems to be adequately dealt with, there is a strong need for the establishment of a R&D infrastructure which could serve as a nucleus for the growth and development of welding technology in the developing country and to fill the existing gaps in the technology today.

Therefore, the Welding Research Institute, set up for catering to the above needs of the country, could work for the following general objectives -

- * To serve as an effective centre for the dissemination of knowledge
- * To concern itself primarily with applied research in the field of welding processes, welding technology and development of special welding machines
- * To carry out some amount of fundamental research which might arise during the course of applied research, especially in the field of weldability, welding metallurgy and welding processes
- * To undertake designing and testing of welding machineries to meet the needs of the country
- * To render consultation and quality control service to the fabrication industries and to the welding machinery producing industries

- * To provide consultation in welding design work
- * To provide training and testing facilities from welders to engineers at all levels engaged in the fabrication industry
- * To render assistance to the technical teaching institutions in the conduct of diploma, undergraduate and post-graduate course
- * To coordinate with the country's and International Standardisation bodies in the formation of standards in different fields of welding, including weldability of materials
- * To render assistance in the import of technology and specialised equipment/consumables
- * To keep abreast with the latest developments in welding technology elsewhere in the world and to work further on them to stem out innovation and breakthroughs in the welding field
- * To liaise with International Societies devoted to the cause of welding

The proposed Welding Research Institute should be an application-oriented Industrial Research Centre, which should have a close liaison with a large industrial undertaking using welding as a major tool of fabrication. The preference should be given to, wherever possible, a large Government Undertaking so that the transmission and feedback information could be carried out without any difficulty and to the best advantage of industry as a whole. All available resources and facilities that already exist in other Institutes and Organisations in the country should be fully availed of,

and the proposed Welding Research Institute should be woven into a central pattern providing necessary guidance and assistance to the entire industry from a strategic location. The establishment of the proposed Institute could be done in two phases so that after establishment of 1st phase successfully and gradual build-up of trained manpower, 2nd phase should be taken up to augment the existing facilities and enhance the scope of operation.

1.4 Outputs:

- | | |
|----------------------------|------------------------------|
| A) Training | 12 months from starting date |
| B) Research & Development | 12 months from starting date |
| C) Documentation | 10 months from starting date |
| D) Consultancy | 15 months from starting date |
| E) Quality Control Service | 15 months from starting date |

1.5 Activities:

- A) Design, Development of Prototype Special Welding Modules/Attachments to suit Industrial Requirements;
- B) Process and Technology Development;
- C) Metallurgical Investigation and Weldability Studies;
- D) Performance Appraisal of Sophisticated Welding Systems and adoption of these Processes to Industry;
- E) Offer Quality Control Services to various industries -
 - 1) Destructive Testing
 - 2) Non-destructive Testing

F) Training:

The following training programmes are planned per annum:

	<u>No.of programs</u>	<u>Duration in weeks</u>	<u>No.of persons to be trained</u>
Basic Welding Technology for engineers	4	8	50
Basic Welding Technology for Supervisors	3	8	45
Basic programme for welders	Conti- nuous	16	100
Advanced programme for skilled welders	Conti- nuous	12	100
Special short term programmes	8	1	120
Package programmes tailor-made for industries	3	3-4	75

G) Documentation Services:

- 1) Dissemination of technical information through computerised storage and retrieval system and Hard-copy service;
- 2) Distribution of abstract bulletins to industries and individuals in the country;
- 3) Publishing technical bulletins

H) Consultancy:

- 1) Attend to live problems of industries

- 2) To obtain short and long term projects sponsored by industries at the Institute;
- 3) To conduct seminars and workshops

1.6 Framework for effective participation of National and International Staff in the Project:

The activities necessary to produce the indicated output and achieve immediate activities of the project will be carried out jointly by the National and International Staff assigned to it. The respective roles of the National and International Staff will be determined by their leaders, by mutual discussion and agreement, at the beginning of the project and set out in a framework for effective participation of National and International Staff in the project. The framework will be reviewed from time to time. The respective roles shall be in accordance with the established concept and specific purposes of technical cooperation.

1.7 Development Support:

A National Seminar is proposed for organisation, to publicise the activities of the project, to encourage positive participation of various welding and fabrication industries in the activities of the project, and to utilise the presence of International Staff of the project. This would enable the Institute to formulate need-based developmental plans that would ensure an effective contribution to the industrial growth.

1.8 Institutional Framework:

The project proposed for its continued and ideal

contribution to the industries should preferably be attached to the Government Sector and further to a fabrication industry being run successfully under the Governmental guidelines. The main reasons for the proposed set-up are -

- * The Institute would utilise the infrastructural facilities already available with the industry in the form of trained manpower, land, water, communication and other supporting facilities;
- * The Institute would not have any disparity in the working conditions compared to that of the industry to enable a sustained growth and contribution of the Institute to the industries;
- * The industry itself would be a great beneficiary of the Institute;
- * The forward linkages of the industry would very well be utilised by the Institute;
- * The running expenditure and corresponding service charges of the Institute would be lesser due to utilisation of support services from the industry;
- * The industry would be prepared for supporting the Institute out of its internal resources;
- * The services from the Institute would be production-oriented;
- * The Institute would cater to need-based requirements of the industry

The Institute would have an Advisory Committee consisting of representatives from Government departments concerned and user industries to derive their support and participation in the activities of the Institute in order to maintain a high level of interaction for filling up the gaps identified. The Committee would also advise the Institute on the current future activities of the Institute.

1.9 Prior Obligations and Pre-requisites:

The necessary land for the Institute and other supporting facilities should be made available for setting up the Institute quickly. The Government would authorise an expenditure equivalent to US \$ 5,825,000 for capital investment and US \$ 2,868,800 for staff salaries and other miscellaneous expenses.

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