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UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

PROJECT PROPOSAL

*M. Lee, Headed*

*CC 89/333*

PART A - BASIC DATA

COUNTRY : Korea/USSR/United Kingdom

PROJECT NUMBER :

PROJECT TITLE : "Monitoring of Non-ferrous Metallic and Non-metallic Wear debris in Lubricating Oils": co-operative agreements among the Korea Institute of Science and Technology, (KIST) Seoul, Korea, the Metal Polymer Research Institute (MPRI) of the USSR Academy of Science, Gomel, USSR, and the Swansea Tribology Centre (STC), Swansea, United Kingdom

SCHEDULED START : 1st April, 1990

SCHEDULED COMPLETION : 31st March, 1992

ORIGIN AND DATE OF OFFICIAL REQUEST : (1) Memorandum of understanding between KIST and STC  
(2) Protocol on collaboration in scientific research between Metal Polymer Research Institute (MPRI) and University College of Swansea  
(3) Provisional agreement between the three institutions for a three-way project

UNIDO CONTRIBUTION : US \$ 60,000

UNIDO SUBSTANTIVE BACKSTOPPING SECTION :

PROGRAMME COMPONENT CODE :

PROPOSAL SUBMITTED BY : 3 Institutions

DATE OF SUBMISSION :

20/9

## PART B - NARRATIVE

### 1. Background and Justification

Industrially-oriented research is recognised in developed and developing countries as an important tool in industrial development. Different countries have defined their scientific and industrial research policies to differing extents and have reached different levels in their implementation of those policies. However, there is now general agreement that it is important to modify existing research organisations or to establish industrial research organisations so that they may become focal points for innovation and technological improvement. Because of constant rapid developments in technology, research organisations are having to adapt their structures and the scope of their activities to deal with such changes.

In the United Kingdom this problem was recognised by the Government in 1967, and a number of Industrial Units were set up in universities to act as bridges between academic research and industrial applications. The Swansea Tribology Centre was one of the earliest of those Industrial Units.

The Korean Institute of Science and Technology has always had strong links with industry, and much of its research is carried out in co-operation with industry and on industrial problems.

In the USSR there is increasing recognition of the importance of research on industrial problems, and all research institutes are placing greater emphasis on research on industrial problems and research funded by industry.

In the same way it has been realised that international cooperation between research organisations is necessary at many levels to encourage progress and to reduce duplication, and the importance of UNIDO's role in encouraging such cooperation has been recognised.

The main purpose of the project is to exchange technologies, experience and expertise between the three nations and the three institutions in order to achieve greater progress in the development of techniques for wear debris analysis and plant condition monitoring.

All three institutions have been working on different aspects of wear debris monitoring. The section under Dr. O.K. Kwon at KIST has been involved in new methods for the separation of wear debris from lubricating oils using a magnetic technique, and in the mathematical analysis of wear debris deposit patterns. Work has been carried out at Gomel under Dr. N.K. Myshkin on the combined use of a magnetic field and optical density measurement to differentiate between ferromagnetic and non-ferromagnetic debris. The Swansea Tribology Centre has also been working on magnetic separation technique applicable to ferromagnetic, diamagnetic and paramagnetic materials, and on magnetometric quantification of debris. The Centre has obtained considerable experience in industrial application of these techniques, and is currently working on automatic computer-based techniques for debris analysis.

## 2. Special Consideration

The proposed three-way programme is an extension of existing two-way programmes between KIST and STC and between MPRI and STC by the addition of a KIST-Gomel link. The bilateral nature of the additional link, the financial inputs of the three organisations, and the objectives of the programme are considered to qualify it for support funding by UNIDF.

## 3. Objectives

- (1) The primary objective of the project is to enable scientists in each organisation to become familiar with the techniques used in the other organizations in order to understand the possibilities available for improvements in wear debris analysis and plant condition monitoring.

- (ii) The second objective is to compare and correlate the results obtained by the analytical techniques by the exchange of used oil samples, equipment and personnel.
- (iii) The third objective is to improve the performance of wear debris monitoring by the simultaneous and combined use of the different techniques.
- (iv) The final objective is to develop more sophisticated equipment for wear debris monitoring incorporating in one instrument the different techniques used by KIST, MPRI and STC. It is hoped that this instrument will form the basis production instrument for industrial use.

#### 4. Project Outputs

It is expected that through implementation of this project, all three institutions will increase their capabilities as focal points for innovation and technology improvement in their respective countries, especially in the field of condition monitoring of industrial plant and equipment.

The institutions will also increase their ability to provide training facilities in the operation and application of condition monitoring techniques, and these facilities will be made available to trainees from other countries. Between them the three institutions provide convenient geographical locations for trainees from many different parts of the world.

There will also be facilities for exchange of research staff, visits of experts, and the holding of meetings and symposia.

5. Project Activities

The following activities will be undertaken to achieve the project objectives.

- (i) Visits of technical staff to study the techniques used in the other institutions, and to cooperate in the design of improved and combined techniques.
- (ii) Meetings of senior staff to arrange programmes and review progress.
- (iii) Exchange of monitoring equipment between the institutions.
- (iv) Exchange of used oil and wear debris samples between the three institutions to compare and correlate the results obtained by the different monitoring techniques, and to calibrate improved qualitative systems.
- (v) Organising training courses and symposia.

6. Project Input

UNIDO is asked to provide US \$ 60,000 for the period 1st April 1990 to March 1992 in convertible currency, together with US \$ 30,000 for capital equipment as follows:

Rotary Particle Depositor	(1)	US \$ 10,000
Particle Quantifier	(2)	10,000
Optico-Magneto Detector	(2)	3,000
Computer Interface Units		6,000
Telefax machine		1,000
		<hr/>
		US \$ 30,000

The equivalent of US \$ 155,000 in non convertible currency will be provided by the countries concerned (Korea US \$ 50,000, USSR US \$ 60,000 and UK US \$ 45,000).

The host organisations may pay a per diem allowance to each visitor in this project.

7. Evaluation Plan

The project will be evaluated during the implementation and upon completion by the NGOs, Business and Industrial Institutions Co-operation Section, and PDES with participation of the representatives from KIST, MPRI and STC.

8. Envisaged Follow-up

The first phase of this three-year project will end in April 1991. After careful evaluation of research activities and output during this phase, a long-term follow-up project will be considered by the NGOs, Business and Industrial Institutions Co-operation Section, and PDES.

PART C CLEARANCE AND APPROVAL

Cleared by:

Date:

Date:

Approved by:

Date:

Amount approved

Source of Funds:

Convertible Currency:

Other:

Date PAD requested:

Annex I

WORKING PLAN 1990/1992

1 March 1990	Project Commencement Exchange copies of papers and information. Exchange of samples.	
1 - 4 April 1990	Meeting in Swansea *(Exchange equipment)	US \$ 10,000
6 - 8 July 1990	Meeting in Gomel Seminar on design of equipment	US \$ 10,000
10-12 October 1990	Meeting in Swansea	US \$ 10,000
1 - 3 March 1991	Meeting in Seoul Seminar on 1st year progress	US \$ 10,000
Sept./Oct. 1991	Meeting in Gomel	US \$ 10,000
March 1992	Meeting in Seoul	US \$ 10,000
	Total	<u>US \$ 60,000</u>

All project managers completely agreed that the proposals prepared by the each side were satisfactory without any objection.



NATIONAL CONTRIBUTION :

1990	<u>MPRI</u>	<u>KAIST</u>	<u>STC</u>
Salaries	3,000	4,000	4,000
Equipment	10,000	3,000	2,000
Services	-	2,000	300
Materials	-	4,000	100
Visitors expenses	-	3,000	1,000
Totals	<u>13,000</u>	<u>16,000</u>	<u>7,400</u>
1991	<u>MPRI</u>	<u>KAIST</u>	<u>STC</u>
Salaries	12,000	8,000	16,000
Equipment	10,000	4,000	3,000
Services	-	1,000	2,500
Materials	-	1,000	600
Visitors expenses	3,000	3,000	1,000
Totals	<u>25,000</u>	<u>17,000</u>	<u>23,100</u>
1992	<u>MPRI</u>	<u>KAIST</u>	<u>STC</u>
Salaries	9,000	8,000	12,000
Equipment	10,000	4,000	-
Services	-	1,000	2,200
Materials	-	1,000	300
Visitors expenses	3,000	3,000	-
Totals	<u>22,000</u>	<u>17,000</u>	<u>14,500</u>
Grand Total	<u>60,000</u>	<u>50,000</u>	<u>45,000</u>

CURRENCY REQUIRED FOR

UNIDO INPUT : US \$ 90,000  
CONVERTIBLE : US \$ 90,000  
OTHER : NIL