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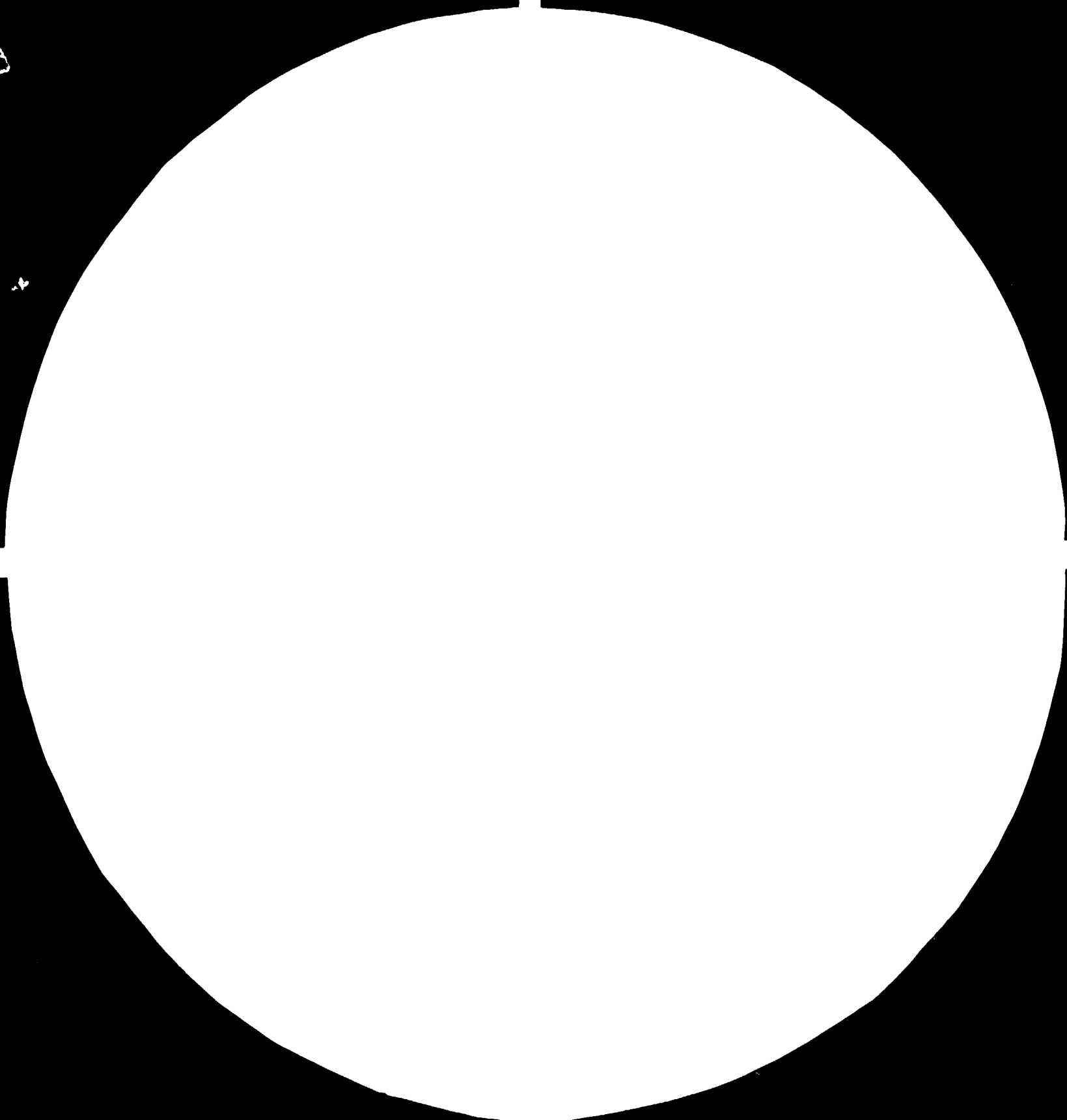
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3.2



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## MICROCOPY RESOLUTION TEST CHART

NATIONAL BUREAU OF STANDARDS  
STANDARD REFERENCE MATERIAL 1010a  
ANSI AND ISO TEST CHART No. 2

13516

Romania.

PRODUCTION AND FORMULATION OF PROCESSING  
OILS FOR CHEMICAL FIBRES FABRICATION AND APPLICATION

SI/ROM/82/862/11-53/32.1.H.

R O M A N I A

Terminal Report for the Second Phase of  
Split Mission

Based on the work of TAKAO KARIYONE, expert  
in production of processing oils for chemical  
fibres fabrication and their application.

1983

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EXPLANATORY NOTES

References to dollars (\$) are to United States dollars.  
The monetary unit in Romania is the "lei" (plural "lei").  
During the period covered by the report the mean value  
of the "lei" in relation to the United States dollars  
was 1 \$ US = 12,5 lei

19 August (Fri)

Mr. Ramond Rabenold

Mr. Ion Marinescu

Resident representative

UNDP Bucharest

Director Joint UNIDO Romania

Centre Bucharest

20 August (Sat)

Mr. Săndescu Nicolae

Dr. Săndescu Felicia

Dr. Mătaru Doina

Mr. Iulian Daneschin

Chief Eng. Săvinesti

Chief of Chemical Laboratory

Chief of 2nd Acrylic Fibre plant

Chief of Protocol

21 August (Sun)

Dr. Săndescu Felicia

22 August (Mon)

Dr. Săndescu Felicia

Eng. Iulia Anghinici

Eng. Cecilia Botezatu

Dr. Mătaru Doina

Chief of Polyamide Plant

Eng. Research Centre

23 August (Tues)

Dr. Felicia Săndescu

24 August (Wed)

Dr. Felicia Săndescu

Dr. Mătaru Doina

25 August (Thu)

Same as above

26 August (Fri)

Mr. Petrescu Dumitru

Mr. Cecilia Botezatu

Eng. Polyamide

27 August (Sat)

Dr. Felicia Săndescu

Mrs. Cecilia Botezatu

28 August (Sun)

Same as above

29 August (Mon)	Mrs. Paula Muhlbecker Miss. Rosica Agafitoi	Chem. Eng. Techn. Dept. Chem. Eng. Research Dept.
30 August (Tues)	Mrs. Margareta Vici Mrs. Eugenia Spulber	Chem. Eng. Research Dept. "
31 August (Wed)		
1 September (Thu)	Mrs. Paula Muhlbecker Mr. Tuzcu Dumitru	
2 September (Fri)	Transfer for Pietra Neamt	
3 " (Sat)	- Free day	
4 " (Sun)	- Free day	
5 " (Mon)	Mr. Petrescu Dumitru Mrs. Cecilia Botzatu	
6 " (Tue)	Same as above	
7 " (Wed)	"	
8 " (Thu)	"	
9 " (Fri)	"	
10 " (Sat)		
11 " (Sun)		
12 " (Mon)	Same as above	
13 " (Tue)	Dr. Felicia Sindescu Dr. Tataru Doina	
14 " (Wed)	Same as above	
15 " (Thu)	"	
16 " (Fri)	Dr. Felicia Sindescu Mrs. Miron Victoria	Dr. Tataru Doina Mr. Hibary Augustin
17 " (Sat)	Dr. Felicia Sindescu Dr. Tataru Doina	
18 " (Sun)		
19 " (Mon)	Dr. Felicia Sindescu	Dr. Tataru Doina
20 " (Tue)	Same as above	



21	September	(Wed)	Same as above
22	"	(Thu)	"
23	"	(Fri)	"
24	"	(Sat)	"
25	"	(Sun)	Free day
26	"	(Mon)	Same as above
27	"	(Tues)	"
28	"	(Wed)	Making of Thermanal report
29	"	(Thu)	Final discussion
30	"	(Fri)	Protocol

## S U M M A R Y

The first phase of the project entitled "Production and Formulation of Processing Oils for Chemical Fibres Fabrication and Application" (SI/ROM/82/802/11-53/32.1.E), began in 1982 with the assistance of expert, Prof. Dr. Watanabe, the second part of the mission being completed by Mr. T. Kariyone between 19 August and 3 October 1983.

The mission took place at the request of the Romanian Government for assistance from the United Nations Industrial Development Organization as executing agency for UNDP.

The main objectives of the project are as follows:

- 1) Production of finishing products for chemical fibres fabrication
- 2) Production of Processing Oils and their formulation for chemical fibres fabrication.

The expert's duties consisted of the following main objective:

Namely, the improvement of processing oils for each chemical fibre, processing oils formulation and synthesis technology of surfactants containing important components for processing oils fabrication, together with domestic chemicals depending upon availability.

Unfortunately, at the present time, the objectives of this project have not been completely accomplished. One of the main reasons for this stems from the fact that there is not enough knowledge in physico-chemical behaviour of surface active agents and processing oils. I strongly recommend to UNIDO that this project should continue further in the future.

## I N T R O D U C T I O N

I received job descriptions for posts SI/ROM/S2/802/11-51/32.1.H and SI/ROM/S2/S02/11-53/32.1.H concerning "Production and Formulation of processing oils for chemical fibres fabrication and application", and also reviewed Mr. Watanabe's terminal report.

Mr. Watanabe had many problems concerning processing oils. At the beginning of my mission I was fortunate in having the assistance of Ms. Shoichi Shimizu to consult and work together on the project activities between 18 August and 1 September 1983. We visited acrylic and polyamide plants in Savinesti. Several books (Properties application and analytical methods of surfactants) and documents referring to testing equipment for the textile industry were given to the Central Personnel.

A large amount of time was spent giving advice and answering specific questions and problems concerning processing oils. A visit was made to Iasi (polyester fibres and yarns) lasting three days, where personnel questions were answered and recommendations given.

On 5 September intensive discussions were held with polyamide specialists and Kao's various polyamide finishing oils were tested in their plant (cord and textured yarns). The test result was a total success.

Between 13 September to 30 September intensive discussions were held with acrylic specialists concerning the following; systematic analytical methods of processing oils, application of analytical data on formulation of processing oils, synthetic methods of some important surface active agents (nonionics, anionics, cationics and amphoteric); selection of surface active agents and raw materials existing in Romania according to the list given by the Romanians, and also general important physico-chemical phenomena regarding formulation of processing oils in my specific field.

During discussions with Dr. Sandescu, we tried to test a sample (1 kg) of processing oil from MATSUMOTO SEIYAKU YASHI CO. The test result was also fairly good. We discussed this sample and the evaluated test result from a theoretical point of view.

## FINDINGS

1. All the technical and laboratory staff I met have good chemical knowledge but I regret to say they do not possess enough knowledge concerning processing oils formulation. They do realise, however, the importance of processing oils in order to smooth the operation of synthetic fibre production process.
2. I also found that domestic surfactant products (including formulated products) were limited only to main surfactants (ex. polyoxythylated fatty acids and nonylphenol, sodium alkylbenzensulfonate sodium alkylsulfate, alkyl-naphthalensulfonate, sulfated oil etc.).
3. In spite of above conditions, each synthetic plant operates fairly efficiently, but if the Romanians wish to improve the present processing oils, it will be necessary to obtain a higher level of technology, physico-chemical theory and properties of surface active agents, raw materials of each processing oil.
4. It appears to me that the library of <sup>the</sup> research department does not contain enough books and journals, such as monthly publications concerning oil chemistry, colloid science, surface chemistry (including physico-chemical properties), and analytical chemistry of surfactants etc., especially the english editions.
5. Possibly, the Romanian fibre producer does not possess enough testing equipment and analytical instruments in comparison to the Japanese fibre and processing oil maker.

- G. Taking into account the aforementioned comments and the knowledge required in the processing oil field, I feel it was impossible over the short period (seven weeks) for me to assist and make improvements in the oil processing. In my opinion the mission should have taken place over a longer period (at least 7-10 weeks).

## RECOMMENDATIONS

### General Recommendations

1. The first step in the research laboratory should be to train an engineer who has a thorough understanding of colloid-science, surface activity, preparation and formulation of processing oils and surface active agents application for dyeing auxiliaries.  
  
In one or two years the specialist will have gained sufficient knowledge to cover the field of processing oils and dyeing auxiliaries.
2. Care should be taken concerning the cause and dissatisfaction and the technical programme downstream (e.g. textile mill, spinning mill, dyeing mill, sewing plants and usage) and also to improve production techniques, new quality checking methods or systems related to processing oil problems and good technical control must be kept by plant engineers (or plant group) in order to improve processing oils.
3. In order to achieve the object of the second point, the research laboratory must have enough testing /analytical equipment and measuring methods. Namely, the supervisor must take decisions regarding test items and their testing methods (e.g. us, ud, static voltage, control method determination of emulsion concentration, stability, pH, temperature etc.). Also he (she) has to revise them according to progress in this field.
4. It is important that new receipt tests be carried out using the proper measurements and good apparatus with accurate scientific data and logical thinking.
5. As a preliminary step synthesis introduction and production of important surfactants would be a good way to obtain better quality of processing oil formulation. It should not be forgotten that parallel action should be implemented, namely, training of a physico-chemical and analytical expert in the scope of processing oil formulation.
6. In order to accumulate and increase the technical reference of the Central Research Laboratory English editions should be obtained, such as, technical and academic journals, books regarding oil chemistry, colloidal science, surfaceactive agents, lubricating theory, analytical chemistry etc.).

7. As a personal conclusion, it is impossible to seek an early solution to the processing oil problem in the Romanian synthetic production industry, due to the following points:

- a) The specialists do not possess enough knowledge of surfaceactive agents and their physico-chemical properties, which is necessary for processing oil formulation.
- b) Experts cannot easily select desirable raw materials (mainly as lubricants) and surface active agents (as emulsifiers, lubricants and antistatic agents) for processing oils in Romania.
- c) For instance, proper processing oils most definitely require a delicate balance with regard to fibre/fibre (Fi/Fi) friction coefficient (u) from dynamic stage (ud), static stage (us) also fibre/guide Fi/G ud, us, G: guide=ceramics, metal etc., fibre/rubber Fi/R ud, us. R=generally = synthetic rubber rollers Fi/R ud, us, antistatic properties, OPU (oil pick up on fibre), spinning speeds, surface structure, shape, length of synthetic fibre, reaction. type of synthetic fibre chemical structure, uniform coverage of processing oil film on fibre, antirust properties to metal, antistatic properties to rubber roller, heat stability of processing oils for synthetic fibre and spinning process etc.
- d) As mentioned previously (3) the balance of these factors does not have the same requirement for the whole textile process.

For instance, the drawing process requires relatively low Fi/Fi ud, us and good wetting, spreading force on the fibre and boundary lubricity, also fairly good antistatic properties. Carding and sliver processes require low Fi/Fi u and Fi/M u and excellent high antistatic properties. In contrast, the yarn spinning process requires high Fi/Fi us, high antistatic properties and good adhesive force interfibres with hydrodynamic lubricity.

Taking into account the aforementioned reasons it is also difficult to transfer the formulation - know-how of processing oils for each synthetic fibre, as processing oil formulation is one of the scientific arts, and may be compared in complexity to perfume or cosmetic art.

8. As my final recommendation:

- a) It should be noted that if the Romanian specialists expect further improvement of each processing oil, it will be necessary for UNIDO to extend the project for a further 7-10 weeks, the funds to be provided from the UNIDO budget.
- b) Should UNIDO make a favourable decision on this point, I would advise the assignment of two experts for Romania, one expert to be an analytical chemist and the other expert for processing oils formulation (including good experience and knowledge in surfactants synthesis).



3. Final recommendation contd..

The analytical chemist should be trained and experienced in surfactants and processing oils.

The chemist for processing oil formulation must be able to test refer to different receipts of processing oils, using domestic raw materials and surfactants.

The next stage of the project would be the testing of new receipts of processing oils for each synthetic fibre on laboratory screening and pilot plant.

RECOMMENDATIONS FOR ACRYLIC FIBRES

1. Snow, lint and wrapping decreasing
  - a) A stricter standard control must be maintained of mother emulsion concentration, oiling both temperatures, OPU on fibre and uniform coverage, impurities removal from oiling bath, new emulsion addition control etc.
  - b) Changing of components mixing raticanal new receipt testing on laboratory screening and pilot plant.
  - c) Actual obtained test data must be evaluated by the Romanian experts from a wide viewpoint.
  
2. Recommendation for polyamidic fibres  
Neps decreasing
  - a) Confirmation of OPU and uniform coverage on fibre
  - b) Uniform strength force on each filament, keeping as tight control as possible with the use of machines.
  - c) Analysis of neps cause with scientific measurements and their data:
    - from lubricity point of view
    - from antistatic properties point of view
    - from OPU on fibre
  - d) OPU method improvement
  - e) Research of best formulation for each product (tire cord, filament, spun yarn, weaving, knitting, industrial use yarn etc.).
  
3. Recommendations for polyester plant
  - a) Uniform coverage on fibre must be confirmed by measurement
  - b) Improvement of heat resistance properties of present new oils

Unfortunately there was not enough time to have discussions with polyesteric experts.

