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18736

**ASSISTANCE IN IRON ORE
AND IRON SCRAP
PROCESSING**

PROJECT - DP - ANG - 79-008 UNIDO

UNIDO - CUBATECNICA

18736

ASSISTANCE IN ERCH CASE

AND ERCH SUIT

PROCEEDING

(PROJECT BR-AMC-73-003 - 107)

Auth by:	W.C.	John D. ...
	Techn.	Atlantic ...
	Techn.	Domingo ...

S U M M A R Y

SUMMARY

The requirements of the project for iron scrap processing of SHANON Enterprises of Senegal, Senegal, the first in African - continent with its own characteristics, established the need of providing training courses for more and better utilization of locally available means.

The following theoretical and practical courses were carried out:

- Iron scrap recycling - with 10 students
- Collecting and preparing iron scrap - with 10 students
- Electricity - with 10 students
- Identification of equipments - with 10 students
- Mechanical maintenance of equipments - with 10 students

There was a large participation of the workers, who were trained in the use of the equipments, maintenance and repair of the equipments, and the use of the equipments.

The project was successful, as shown at the end of the project, when the workers were able to use the equipments, and the use of the equipments was improved, and the use of the equipments was improved, and the use of the equipments was improved, and the use of the equipments was improved.

great good, in a better position for the future of the
commission.

During the meeting, the following items were discussed:

- Review of the proposed budget
- Review of the proposed schedule of work

The meeting was held in a friendly and informal atmosphere, and
it was agreed that the following items should be discussed at the next
meeting on the 15th of the month.

During the meeting, the following items were discussed:
The first item was the proposed budget, which was discussed in detail
and it was agreed that the following items should be discussed at the
next meeting: the proposed schedule of work, the proposed budget,
the proposed schedule of work, and the proposed budget.

The meeting was held in a friendly and informal atmosphere, and
it was agreed that the following items should be discussed at the next
meeting on the 15th of the month.

to have with some recommendations and proposals to the managing
committee regarding the general organization of the enterprise,
including the following:

(1) Establishing the authority

The first step in the management of any enterprise is the
establishment of a clear and definite authority structure.

The authority structure of an enterprise is the basis for
the organization of its activities, and it is the responsibility
of the management to establish and maintain a clear and
definite authority structure. The authority structure should be
based on the principle of unity of command, and it should be
designed to ensure the most efficient use of the enterprise's
resources.

The authority structure of an enterprise should be based on
the principle of unity of command, and it should be designed to
ensure the most efficient use of the enterprise's resources.

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the principle of unity of command, and it should be designed to
ensure the most efficient use of the enterprise's resources.

The theoretical and practical training courses were prepared by United Nations experts for Recovering Raw Materials of the Soviet Union, the Pacific and Material Supply of the Republic of China. The advising was given by technical assistance.

RESEARCH IN THE USE OF
TECHNICAL INVENTIONS
(INSTRUMENTS-79-300 UNCL)

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SECRET

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INTRODUCTION:

From February to October, 1966, took place a technical advisory in the Popular Republic of Angola in the theoretical and practical themes of extracting technics with gasses, including handling and care of equipments; collecting and preparing secondary raw material (scrap); and electric and mechanic main stands of industrial equipments, which was properly fulfilled.

For this purpose, five theoretical and practical courses were imparted at SUTANOR Enterprise's scrap yard in Luanda, including collection of this product as a production's residuum or abort in Angola's main industries.

It was also possible to make a series of recommendations and proposals to the Enterprise for a better working organization in the scrap yard, and for an efficient collection of this scrap in the main sources.

Preliminary guides for collecting nonferrous scrap (aluminum, copper, bronze) and their classification and conditioning including the necessary equipment to be used for that purpose.

This report comprises details on the advisory, its results, as well as recommendations and proposals for developing this activity.

which have been discussed in detail with the Executive Board of SUCANOR Enterprise; consist in an analysis on the work performed and their results, and four Annex which enlarge and specify it.

ANALYSIS ON THE WORK PERFORMED AND THEIR RESULTS:

The advising activity, in conformity with UNED's request, was organized in five (5) theoretic and practical courses with a duration of 6 weeks for two of them; 2 months for the other two; and 3 months for the last one.

During the development of these courses, owing to the knowledge acquired by our personnel of the situation of the Enterprise and its difficulties, a series of recommendations and proposals were done, some of them have already been put into practice.

The courses imparted and the results obtained are given, briefly, below:

COURSE 1

Training for executives from SUCANOR

The objectives of this course, according to the request, were the following:

Make known any existing techniques, including types for cutting with
pneumatically operated, their storage, care to have them --
described in a report, equipment, etc. and their use and life.

Train the workers in existing practice and the adequate use of
the equipment and facility; standardize the practice and training
the time.

The programme had a duration of six weeks, if the workers
are familiar with the practice. It took place in the
factory, with one hour for theory and seven hours for
practical work. The theoretical programme had the following:

1. Introduction

1. Introduction, classification and their applications of steel
and non-ferrous metal alloys.

Introduction to the subject

Basic concept of the activity of heat treatment of steel

Peritectic alloys

Types of steel

Peritectic alloys

11. Materials for gas flame cutting; fuel gases, oxygen
and management.

III. Equipments and appliances for gas flame cutting and
welding elements:

Exhausting equipment.

Work's regulation

Equipments and protection means

IV. Gas flame cutting technology

Gas cutting, steel cutting

Cutting methods according to:

piece's dimension and their characteristics;

metal's temperature, homogeneity and thickness;

metal's composition: ferrous and cast iron

and nonferrous alloys;

Factors which influence cutting. Work's power

Pressure's regulation for cutting process

Heating and cutting flames

Cutting advancement velocity.

V. Gas cutting in iron scrap

Dynamic for gas cutting work.

- Form in which the theoretic and practical course was developed:

Written conferences were done and given to the students. According to the programme, there was a control and a final examination.

There were four groups of study with 7 students each.

Partial Control was held after Unit IV, and final examination comprised the main aspects of the programme.

- Results:

28 workers of the Enterprise attended the course, 7 of them -- reached a mark of excellent and 21 passed certificate.

A Certificate signed by the Enterprise's Executive Board and UNIDO's Representative was given to each student.

For more information regarding this course, see Annex 1.

COURSE 2:

Collecting and Preparing Iron Scrap:

The objectives of this course, according to request were:

Give the personnel the necessary knowledge of collecting iron scrap and preparing techniques, including types and sources of generation as well as their classification and arrangement.

Perform practical activities of collecting, selecting and preparing iron scrap.

The programme had a duration of 210 hours; 30 theoretical and 180 - practical, and consisted of:

- Give the personnel the necessary guidelines which enable them for carrying out a better collection of iron scrap.
- Achieve a correct selection and classification of iron scrap.
- Do the students be able to make an adequate preparation of iron scrap and metallic wastes.

The theoretical programme had the following:

- Thematic Plan:

- I. Introduction, basic concepts of secondary metals - recovery; terms and definitions.
- II. Sources of iron scrap formation and ferrous metal - wastes; of production and services; of domestic; metal recycling.
- III. Organization of iron scrap collection and ferrous - metals wastes:
Planning recovery
Organizing the collection
- IV. Selecting and classifying iron scrap and secondary - metals wastes:
Iron scrap classification
Collection of secondary metals
- V. Pyrotechnical control.
- VI. Iron scrap and metallic wastes transportation.

VII. Working organization for iron scrap preparation, -
ferrous metal wastes. Objectives.

VIII. Preparing iron scrap and metal wastes:

Cutting with flame (oxycutting) iron scrap

Cutting with shears

Pressed of iron scrap

Metallic shaving trimmings and briquetting

Iron scrap fracture

IX. Iron scrap and nonferrous metal wastes:

Aluminum and its alloys

Copper and its alloys

Tin; lead; others

X. Metallic Fund:

Importance of metallic fund in the economy

Forms in which the theoretical and practical course was
developed:

Copies of the lectures for studying were handed to the --
students.

On Friday, every week, written evaluations were held.

Three groups of study, of 7 students each, were organized.

There was a partial control after the end of Unit VIII, and a final examination which comprised the main aspects of the programme.

- Results:

21 workers of the Enterprise attended the course; 7 of them got a mark of excellent; 14 passed certificate (unanimous). Each student received a Certificate signed by UNIDO's Executive Board and UNIDO's Representative.

For more information, please see Annex C.

COURSES 3 TO 5:

These courses were organized answering a request of UNIDEP Enterprise of training a group of workers in mechanical and electrical maintenance for industrial equipment. The objectives were: improving the knowledge of maintenance personnel of UNIDEP regarding electric/electronic maintenance; carry on the practical maintenance at the Enterprise, taking care of the main equipments (press, hydraulic shears, cranes, etc.).

For carrying out this training properly, these courses were organized: Practical Electricity; Electrical Maintenance and Mechanical Maintenance. In the two first courses the same group of students took part; another group participated in the Course for Mechanical Maintenance. Engineer Carlos Latina, Head of this activity at SINDIA Enterprise attended the final classes.

The courses developed as follows:

Practical Electricity:

- Practical Electricity:

Duration of the course: 2 months

Total of students: 10

The objective of the course was bring up to date and train the technicians in the thematic, as well as qualifying the workers.

It was organized in two groups: one of two middle-grade technicians and one technician of higher degree; the other course composed of 7 workers.

The thematic given in 90 theoretical hours and 120 practical hours was the following:

- I. Introduction
- II. Electrostatics
- III. Conduction in metallic bodies and in semi-conductors
- IV. Magnetism
- V. Transient and Oscillating phenomena

The results obtained were:

- In the first group: 2 excellent and 1 passed examination
- In the second group: 6 excellent and 1 passed examination

COURSE 4:

- Electrical Maintenance

Duration: 2 months

Total students: 10

The objective of the course was bring up to date and improve the knowledge of technicians in electrical maintenance, and - qualify workers.

It was organized in two groups: one of two middle-grade technicians and one technician of higher degree; the other group -- composed of 7 workers.

The thematic given in 80 theoretical hours and 120 practical hours was the following:

- I. Introduction
- II. Current circuits and their elements
- III. Transformers, basic concepts about three-phase system rotatory electric machines and measuring motors
- IV. Protection and installation of electric motors
- V. Measuring instruments

The results obtained were the following:

- In the first group 2 excellent and 1 passed examination
- In the second group, 5 excellent and 2 passed examination

COURSE 5:

- Mechanical Maintenance:

Duration of the course: 3 months

Total of students: 9

The objective of the course was bring up to date and improve the technical skilfulness in the thematic of mechanical maintenance of technicians as well as qualifying workers.

It was organized in two groups: one of two middle-grade -- technicians, one higher degree technician; the other group, of six workers.

The thematic given in 120 theoretical hours and 180 practical hours was the following:

- I. Introduction
- II. Notions of metal technology
- III. Routines of machines
- IV. Notions of oleohydraulics
- V. Protection of mechanical equipments
- VI. Lubrication

The results obtained were:

- In the first group: 3 excellent
- In the second group: 4 excellent; 2 passed examination

For more information about these courses (3 to 5), see Annex B.

COURSE 5:

- Relevant Information

Duration of the course: 3 months

Total of students: 9

The objective of the course was to bring to the participants the technical disciplines in the current of mechanical manufacturing, and workers' qualification.

Two groups were organized: one composed of 5 students of 1st year and 1 technician of higher degree; the second group composed of 4 workers.

The contents given in 120 theoretical hours and 100 practical hours was the following:

- I. Introduction
- II. Notions of metal technology
- III. Elements of machines
- IV. Systems of electrohydraulics
- V. Protection of mechanical equipment
- VI. Lubrication

The results obtained were:

- In the first group: 3 excellent
- In the second group: 4 excellent
2 passed examination.

For more information about these courses (5 to 8), see Annex 3.

RECOMMENDATIONS AND PROPOSALS TO THE ENTERPRISE:

The technical advising group in charge of these studies, will make some proposals and recommendations (see Annex 4), in order to improve the integral activity of SUSANA Enterprise.

These proposals and recommendations went around the following subjects:

Recommendations:

Organization in the production, transportation and direct work at the yard.

The essential are:

In the production:

- Control all ferrous and nonferrous scrap in the enterprises and factories producers of steel.
- Make know the providers the necessity of selection and non contamination of scrap from different levels.

- Know monthly formation of these scraps (particularly production wastes) of the main suppliers.

Have the required models for these controls.

In transportation:

- Control over transportation training in order to ensure the most economic route and a maximum advantage of its capacity load.
- Ensure the foreseen technical maintenance for keeping the vehicles at optimum conditions.

At the work:

- Daily review of necessary resources for a continuing work, such as: oxygen and available acetylene, hydraulic oil, -- torches, hoses, etc.
- Place conveniently, in a store prepared to that effect, the oxygen and acetylene bottles.
- Place correctly the oxycutters in strategic areas for achieving a greater productivity when cutting by oxycutting.

- Ensure a steady iron scrap inventory for guaranteeing the whole process within each the daily production.

- Ensure that transportation equipment place iron scrap in areas where the production do not be affected, reviewing the yard technological flow to that effect.

With regard to these recommendations, a plan of measures was made, and necessary for a solution in order to their implementation also.

The implementation of many of these recommendations started during our advising to SUCANER Enterprise.

Proposals:

Regarding the Enterprise organization and structure in order to make easy the work to be done. These proposals, enclosed in -- Annex 4, go around:

- The creation of two positions for workers in the commercial section, for being in charge of coordinating, while collecting, with the suppliers.

- **The creation of a position for a technician in work's hygiene and protection, with the aim of ensuring the necessary means and measures for human protection.**

- The creation of a position for ensuring hygiene at the working center, and a review on insecure conditions which may exist: definition on smoking areas, limited access, fire-extinguisher areas, etc.

- Acquiring of some equipments which shall complement the existing ones and shall ensure a larger production and productivity, these equipments are: portable crisselle shears for construction metallic wastes; a press for processing nonferrous iron scrap.

- The construction of a warehouse for equipments, parts and materials possibly to be used again. For this, it is necessary a revision of iron scrap received and recovering parts and equipments which could be returned to the agency and should be stored in this warehouse.

Summary:

The theoretical and practical courses were prepared by the Union of Enterprises for Raw Materials Recovering of the State Committee - for Technical-Material Supply of the Republic of Cuba. The advising was given by technicians from the Union.

PROGRAMME 11.

THE THEORETICAL ACTIVITY OF

UNIVERSITY

III. Outlines for the Course's Development

This Programme comprises the total of theoretical and practical hours; theory shall be imparted one hour in the morning, every day, practice shall be imparted - one hour daily during 6 weeks. On the 7th week - evaluations shall be done.

This course shall be imparted for obtaining a theoretical and practical skill of your specialisation.

This course is arranged for the acquisition and skill work at the workshop, place where the practices shall be performed.

VIII. General Ed.

<u>Unit</u>	<u>Enriched</u>	<u>Total Hours</u>
I	Introduction, classification and identification of ferrous and non-ferrous iron scrap	5
II	Materials for gas flame cutting	2
III	Equipments and appliances for gas flame cutting and supplementary - clippers	7
IV	Gas Flame Cutting Technology	10
V	Engineering in Iron Scrap	5
	Total General	29

11. Analytical Programs

Unit Theme

Outcomes

- I
Introduction, Classification and Identification
of ferrous and nonferrous iron scrap.
1.1 Introduction
1.2 Basic Concepts on the activity of
Secondary Raw Material Recovering
1.3 Ferrous Alloys
1.3.1 Different types of steel
1.3.2 Cast-iron
1.4 Nonferrous Alloys

A brief description on secondary metal recovery in our country, as well as a brief --
comprehension and the most frequent vocabulary of
the activity shall be done.
How to classify ferrous alloys and their different
characteristics.
A reference to the characteristics of weakly alloy
steel and the differences between cast steel and -
cast iron.
Brief explanation about classification of the most
representative nonferrous alloys.

- II
Materials for gas flame cutting
2.1 Fuel Gases, their use and management

Explanation about different types of gases used
in gas cutting and their characteristics. Emphasis
should be made in security standards to observe in
their management and storage.
Analysis on oxygen's temperature and pressure, how
is their influence in cutting and quality of the --
same.

Assignment

Explanation on equipment's components: torches, mono-regulators (for classification), safety locking mechanisms, etc.
The professor shall explain how to regulate the -
Make know the students the safety rules regarding the using equipment and protection. Hence, explaining the standards established for Hygiene and fire prevention.

Oxycutting as a metallurgical operation. Basic principles of autochthonous cutting, cutting essence and cutting capacity.
Influence on oxygene temperature and pressure, its influence in cutting and its purity. Explanation of how regulate torch's power and of what it depends.
How regulate oxygene pressure according to its requirements showing different types of flames by means of drawings. The professor shall explain the best method for obtaining the greater velocity in cutting.
Information of the technique used in presence of others alloys as: cast iron or nonferrous alloys. In concluding the Unit, a Partial Test shall be done.

Objectives

- Equipments and appliances for gas flame cutting and supplementary elements
- 3.1 Cutting Equipment
- 3.2 Torch's regulator
- 3.3 Safety rules and identification tests

Learning Objectives

- 4.1 Safety
- 4.2 Steel Cutting
- 4.3 Cutting Methods according to:
 - a) Piece's dimension and their characteristics
 - b) metal's temperature, porosity and thickness
 - c) various alloy composition (steel or cast iron) and gas nonferrous alloys
- 4.4 Pressure having influence in cutting. Torch's power
- 4.5 Pressure regulation for cutting process
- 4.6 Heating flames and cutting
- 4.7 Advance velocity in cutting

Procedure

The professor shall be allowed to remove for
recutting in a scrap and submitted to lab with
draws or closed receipts before cutting them.
At the end a final test (individual) shall be
done.

Objective

Recutting iron scrap
5.1 Standards for iron scrap
5.2 Iron scrap

I. Evaluation System

I. Partial Test 50 points

II. Final Test 50 points

The Evaluation shall be done in the following form:

I. Partial Test

Partial Test Controls shall be done periodically.

II. Final Test

Final Test shall include the main aspects of the Program.

III. Requirements

Cutting Works with Gas Flame

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117. Objectives

- Give the students the specific and technical knowledge, habits and skillfulness of the course of study, which enable them to assimilate the present technology, apply the knowledge, form their opinions and take decisions.
- Prepare the students for the individual work in the laboratory.

118. Practical Note

This programme is a moderately practical; it has been designed according to the objective pursued for the practical activity, and the program and contents and the necessary preparation for the practical work.

The program, the practical teaching and equipment are all important, as important that tools, equipment and materials are being provided by the professor.

The programme consist in 100 hours, 12 hours for the I stage, 12 hours for the II stage, and 12 hours for the III stage, in which all the skills and techniques required shall be demonstrated.

Specific Objectives

- Give the students the basic concepts about oxyacetylene working post, as well as the different cutting methods used.
- Give the students conformable attitudes and Hygiene and Safety Standards, mainly at workshops.
- Improve habits and abilities in the students which permit them to apply the International Measuring System.
- Promote by means of typical works, attitudes and habits for applying measuring instruments in which be possible to observe quality and application of established standards.

IV.

Thematic Plan

<u>Unit</u>	<u>Thematic</u>	<u>Total</u> <u>Hours</u>	<u>1st</u>	<u>2nd</u>
I	Introduction, classification and identification of ferrous and nonferrous iron castings	2	1	1
II	Materials for gas flame cutting	2	1	1
III	Equipments and techniques for gas flame cutting and welding any element.	2	1	1
IV	Gas flame cutting with flux	2	1	1
V	Iron castings on cutting	2	1	1
	Total hours :	8	4	4

1.1

- a) ...
- b) ...
- c) ...
- d) ...
- e) ...

... of ...

- a) ...
- b) ...
- c) ...
- d) ...

... of ...

1.2

... of ...

1.3

... of ...

1.4

... of ...

5.1.1

Objective

- 5.1.1 Factors having influence on cutting
a) Torch's power
b) Oxygen pressure
c) Cutting velocity, in cut

Guidance

The students shall perform practices of graduation of the same.

Practices handling the equipment for cutting:

- steel
- nonferrous alloy
- cutting with different sheets and/or profiles with the same measures and changing them
- practices of these cutting types
- the professor shall explain oxycutting exercises, evaluating oxygen pressure according to the material and the correct use of torch's pressure power

Practices on cutting velocity shall be performed, in these practices the professor shall make an Individual Test.

It should be taken into consideration the use of protection means by the students, required by the work and security standards should be observed.

5.1.2

Oxycutting in iron scrap

5.1.2 Standards for oxycutting iron scrap

Standards for oxycutting iron scrap shall be --- explained on the practice. Calculate "by rack of the eye", the measures for cutting which shall be verified with the meter. Measures to take with tubes or closed recipients before cutting them shall be seen on the practice.

5.1.3

Oxycutting practices

120 hours shall be dedicated to oxycutting practices, shall be done at full-time and in different materials paying attention to velocity and quality. In the end there will be a final test.

XVII. Evaluation System

- | | | |
|----|----------------------|-----------|
| I | Partial Control Test | 30 points |
| II | Final Test | 30 points |

Evaluations shall be fully practical, both Partial Control Test and Final Test.

I Partial Control Test

Partial Control Tests shall be done periodically

II Final Test

At the end of the Practical Course and in an individual form, shall be performed the final test.

THEORETICAL - PRACTICAL

PROCESSES

FOR CHEMISTS

COURSE OF INSTRUCTIONS

Introduction

This course has been prepared on the basis of following objectives, that is:

- a) Give the technicians the necessary knowledge about the oxy-cutting, including types of cutting with gases, characteristics, starting, care in using oxy-cutting equipments, its operation and technique.
- b) Performance of oxy-cutting practices at the workshop.

This course consist in two Programmes, one for the practical activity, the other one for the theory. The course has a duration of 210 hours, of them, 90 are theoretical and 120 are practical, will last two months, commencing the theory and the practice every day.

II. Objectives of the course.

- a) Give the personnel the necessary knowledge on oxy-cutting techniques, including cutting with gases, - characteristics, storing, care in using oxycutting equipment and operation and techniques of the same.

- b) Teach the students oxycutting practice and proper use of the equipments.

III. Explanatory Note

This programme introduces a series of basic elements, which together with the practice, are of great usefulness for training engineers.

The Programme has a duration of 210 hours; 30 for the theory and 180 for the practice. Shall be imparted in six (6) semesters in the following form:

One (1) hour for theory and seven (7) for practice every week. Theory and practice shall be performed at the working center.

IV. Teaching Process Schedule

Body: State Committee for Technical and Material
 Speciality: Raw Material Recovery
 Occupational Entrance Level: Oxyacetylene
 Duration: 6 Weeks

Weeks per Semester 6 Weeks

<u>No.</u>	<u>Course of Study</u>	<u>Total Hours</u>	<u>Weekly Periodicity</u>
I	<u>Theoretical Stage</u>		
	Theoretical Informatic	30	5/6
	in the Course of Study		
	Sub-Total	30	5/6
II	<u>Practical Stage</u>		
	<u>Stages</u>		
	II	60	10/6
	III	120	20/6
	Sub-Total	180	30/6
	Total General	210	35/6

V. Generalities

Speciality: Raw Material Recovery
Type of Training: Specialization
Course of Study: Chipping
Period of Study: 6 Weeks
Lecture-Weeks: 6 Weeks
Frequency: Daily
Total Hours: 228 hours
Total Hours of
the Course of Study: 210 hours

VI. Objectives

- Give the workers-students the guide to make study the utilization, working, handling and maintenance of chipping equipment in the activity of Raw Material Recovery.
- Make know the Hygiene and Protection conditions of chipping equipment in the activity of Recovery Raw Material Recover.
- Make use a responsible use of chipping tools.

ARTICLE 2

COURSE 2

F A C E B O O K

F A C E B O O K - F A C E B O O K

FOR THE PRESIDENT AND FELLOWSHIP OF THE

COURSE OF COLLECTING AND PREPARATION OF SCRAP
IN ENTERPRISE

Introduction.

This course is been prepared having as fundamental basis the objectives of ILO/UNEP, that is:-

- a) Instruct the personnel with the necessary skilling in the technic of scrap collecting and preparation, including types and sources of classification and preparation of the different scrap types.
- b) Carry out the practical activities of collecting, selection and preparation of the scrap in the enterprise.

This course consist of two programs, one for the practical activity and the other for the theory. The duration of it, is 210 hours, 30 of them is for the theory and 180 for practices, with a duration of two months, combining daily the theory with the practices.

II.- Objectives of the Course

- a) Instruct the personnel with the necessary skilling in the technic of scrap collecting and preparation, including types and sources of classification and preparation of the different types.

- b) Improve the practical activities of collecting, selection, and preparation of the scrap in the enterprise.

III.- Explanatory Note

This program gives a series of basical elements, that together with the practices is of great utility to instruct the scrap - classifiers.

The program has a duration of 210 hours, 30 of them are theory and the rest corresponding to the practical activity. The contents of it shall be given during six weeks in the following - way:

One daily hour of theory and seven practical, the theory and - practices will be carried out in the same laboral centre.

IV.- Plan of the Teaching Process

Organism : State Committee for Technical and -
Material Supply

Specialty : Recovery of Raw Materials

Occupational Level : Scrap classifier

Duration : 6 weeks

Weeks by Semesters

<u>No.</u>	<u>Course of Study</u>	<u>Total Hours</u>	<u>Weekly Frequency</u>
I	<u>Theoretical Part</u>		
	Theoretical Information of the Course of Study	30	5/6
	Sub-Total	30	5/6
II	<u>Practical Part</u>		
	Stages		
	II	60	10/6
	III	120	20/6
	Sub-Total	180	30/6
	General Total	210	35/6

V.- Generalities

Specialty	: Recovery of Raw Materials
Formation method	: Specialization
Course of study	: Collecting and preparation of Secondary Raw Materials
Lecture weeks	: 6 weeks
Period that comprises	6 weeks
Weekly frequency	: Daily
Total hours	: 226 hours
Total hours of course of study	: 210 hours

VI.- Objectives

- Give to the personnel the necessary training in order to be able to perform a better scrap collecting.
- Attain the correct classification and selection of the scrap.
- The students are able to carry out an adequate preparation of the scrap and metallic junks.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

10 11

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

10 11

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

VII.- Considerations for the Development of the Course

This Program contains the total theoretical and practical hours. The theory will be given in one daily hour and the practical - in 7 daily hours during the 6 weeks of the course. Being the evaluation in the 7th week.

This course will be performed as specialization of the theoretical-practical knowledge of their profile.

The course is for the classifiers which working in the group 1, the place in where the practical will be carried out.

VIII.- Schematic Plan

<u>Unit</u>	<u>Schematic</u>	<u>Total Hours</u>
I	Introduction and basical concep- tion about the recovery of Se- cundary metals	3
II	Sources of scrap formation and ferrous metal junks.	1
III	Organization of the scrap recove- ry and ferrous metal junks.	4
IV	Classification and selection of scrap and secundary metal junks	7
V	Pyrotechnical Control	3
VI	Transportation of scrap and metal junks	2
VII	Organization for the preparation of scrap and ferrous metal junks and their objectives	2
VIII	Preparation of scrap and metal - junks	7
IX	Scrap and non-ferrous metal junks	2
X	Metallic sands	1
	General Total	35

III.- APPROXIMATE PLAN

<u>Unit</u>	<u>Thematic</u>	<u>Comments</u>
I	Introduction. Basic conception about the recovery of secondary metals. 1.1 World metal balance.	Explain the conception of the recovery of low-alloy steels. Its social-economic use. Brief description of the recovery at world level. The structure it has in Cuba the using of this scrap in the Domestic Industry and an exportable item. Make know to the students the vocabulary of recovery activity of secondary raw materials.
II	Sources of scrap formation and ferrous metal junk. 2.1 From the production of the steel 2.2 From maintenance 2.3 Domestic 2.4 Recycling of metal	Make a brief description of each one of thematics.
III	Organization for the recovery of scrap and ferrous metal junk. 3.1 Planning of scrap recovery 3.2 Organization of the collecting	The professor will develop the technical aspects of the organization and recovery according to the thematics.
IV	Classification and selection of scrap and secondary metal junk. 4.1 Classification of scrap 4.2 Selection of secondary metals.	The professor will give this class using photos and illustrations. Insisting on the importance of an adequate classification and selection.
V	Pyrotechnical control	Explain what the pyrotechnical control is and the importance of it in the scrap recovery

<u>Unit</u>	<u>Thematic</u>	<u>Considerations</u>
VI	Transportation of scrap and metallic junks	Explain the transport that is used and the adequate organization for better storing and delivering of scrap
VII	Organization for the preparation of scrap and ferrous metal junks. Objectives.	Explain the necessary organization in the yard, station, and sources of scrap recovery. Mentioning the equipment to be used in the activity.
VIII	Preparation of scrap and metal junks. 8.1 Cutting by flame of scrap 8.2 Cutting by shears 8.3 Pressed of scrap 8.4 Crushing and briqueted of metallic shavings 8.5 Fracture of scrap	A brief explanation of each equipment that is used to prepare the scrap, its functioning and importance. - Advantages among the different equipments. Mentioning examples. Perform the partial control to the students.
IX	Scrap and non-ferrous metal junks 9.1 Aluminium and its alloy 9.2 Copper and its alloy 9.3 Tin 9.4 Lead, others	A detail explanation the classification, selection, - storing, preparation and delivery of scrap and non-ferrous metal junks more common.
X	Metallic Funds 10.1 Importance of the metallic funds in the economy.	A brief description the determining ways of the metallic funds. Explain its importance for the economy of the country, as well as examples of this work in Cuba. At the end of the last unit, the <u>final test</u> will be done

II.- Evaluation System

I.- Partial Control

50 points

II.- Final Test

50 points

The evaluation shall be done in the following way:-

I.- Partial Control

Perform periodically partial control works.

II.- Final Test

The final test will comprise the fundamental aspects of the program.

III.- Bibliography

"Processing and elaboration of secondary metals".

I.I Bobgi, N.V. Anisimov and V.P. Volobuev

III.- Objectives

- Instruct the students in the skilling, habits and technical ability of the course of study, which permit them to assimilate the present technology, application of knowledge, formation of consciousness and taking decisions.
- Prepare the students for the individual work on the production.

XIII.- Explanatory Note

This program is mainly Practical, it is concerned with the objective to be achieved for the practical activity, in its proportional content and the necessary preparation for their working post.

To give the practical instruction and fulfill all the Foreseen works.

This program consists in 100 hours, from them 50 correspond to the II Part the rest to the III, in where will teach all the required abilities.

IV.- Specific Objectives

- Provide the students the basical conception about the better organization of a scrap yard.
- Develop Habits and abilities in the students which permit them to classifier and select correctly the scrap.
- Develop by typical works the abilities and habits in the equipment for preparation or disposing of scrap.
- Give the possibilities to the students by planning with the best transport exploitation.

III.- Technical Plan

<u>Unit</u>	<u>Thematic</u>	<u>General Pages</u>	<u>II</u>	<u>III</u>
I	Formation sources of scrap and the ferrous metal junks.	4	4	-
II	Organization of scrap recovery and ferrous alloy junks.	4	4	-
III	Classification and selection of scrap and secondary metal junks	10	10	-
IV	Hyrotechnical control	2	2	-
V	Transportation of scrap and metal junks	2	2	-
VI	Organization for the preparation of scrap and ferrous metal junks	4	4	-
VII	Preparation of scrap and metal junks	10	10	-
VIII	Scrap and non-ferrous metal - junks	2	3	-
IX	Practices in classification, - selection and preparation of scrap	100	-	10
	General Total	130	40	10

XVI.- Additional Program

<u>Unit</u>	<u>Title</u>	<u>Considerations</u>
I	Definition of terms of scrap and metal ferrous junk	Take the students to the places where the alloy junk or scrap are originated, such as Siderurgical or Factories
II	Organization of the recovery of scrap and ferrous alloy junk	Perform the organization of the scrap yard as a practice, distributing the scrap and junk according to their sizes and the alloys composition.
III	Classification and selection of scrap and secondary metal junk	In the yard of Enterprise should explain the classification and selection as a practice, instruct the students to identify the alloys
IV	Pyrotechnical control	Perform the practice in a Military Unit with the corresponding models.
V	Transportation of scrap and metal junk	Visit the different suppliers to perform, as a practice, the best transportation and placing the load.
VI	Organization for the preparation of scrap and ferrous metal junk	In the origin place of scrap and junk, have work in the organization directed to the consumers: scrap custom-made or large for oxicutting scrap up to 9 mm for the press-shear
VII	Preparation of scrap and metal junk	Practices with the selected material in the press-shear and oxicutting; observe the adequate technics to increase the exploitation of the equipment and keep the safety rules.

<u>Unit</u>	<u>Thematic</u>	<u>Considerations</u>
VIII	Scrap and non-ferrous metal junk	<p>Perform an individual Practical Control.</p> <p>The practical of classification and selection of scrap and non-ferrous alloy junk will be in the yard of the Enterprise.</p> <p>The students shall make a collection of samples with the more representative alloys.</p>
IX	Practices in the classification, selection and preparation of scrap.	<p>The general practices of classification, selection and preparation of scrap will be made.</p> <p>At the end the individual evaluations will be carried out which will be <u>final test</u></p>

XVII.- Evaluation System

I	Partial Control	50 points
II	Final Test	50 points

The evaluations will be entirely practical, either the Partial Control or the Final Test.

I Partial Control

Perform periodically partial control works

II Final Test

It will be done at the end of the practical course and individually

100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200

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Results of the Practical Training:

The practical training was planned based on the production work, performing the collecting, classification and preparation of - the scrap in the origin sources.

The collecting work was carried out in the areas of the National Siderurgical of Angola.

Participating in it, the trucks for collecting, the drivers - and their respective helpers, they work in the preparation of the scrap in order to have an exploitation more rational of transport. They also worked in the preparation of empty or under-made wagon was delivery directly to the Siderurgical.

Work Results

Comparative state of the January and February months with March - (the training month)

<u>January Plan</u>	<u>Plan</u>	<u>Real</u>	<u>%</u>
Scrap dispatching	550.0 tons	558.8 tons	101
Scrap collecting	630.0 tons	677.3 tons	108

February Plan

Scrap dispatching	650.0 tons	658.1 tons	101
Scrap collecting	700.0 tons	734.3 tons	105

March Plan

Scrap dispatching	730.0 tons	739.3 tons	101
Scrap collecting	750.0 tons	751.1 tons	100

It is necessary to make clear that in the month of March there were serious difficulties which affected the dispatching and collecting plan. There were the following:-

5 days of interruption for lack of oxygen
2 days of interruption for raining
1 day of interruption due to the Carnival of the Victory
2 days of interruption for breakage of press-shear
2 days of interruption for breakage of portal crane

It can be observed, if there were not exist such difficulties, - it would broadly overpassed the production plan in the month of march.

This training was carried out to provide the students with the necessary skilling in the technic of scrap collecting, preparation and transportation including types and sources, classification and preparation of different varieties of ferrous and non-ferrous scrap.

In the work area, the scrap was prepared for a best exploitation of the transport and a better assimilation of the Press-Shear in SUCANOR yard. The scrap was prepared to send directly to the derungical, avoiding the doble manipulation.

In this practical training also participated Domingo Gallo, instructor of Oxicutting with flame.

In the training was explained the best way to transport the Oxygen and Acetylene Bottles, and the better manner to cut the scrap in order to spend the less fuel gas as possible.

Perform the operations without danger for the oxicutter nor the helper.

In general, we understand that the practical training obtained expected results, in token of is the accomplishment in the month of march when the production was at 101% in transporting and 102% in collecting.

Appendix B - Description of the Theoretical Part

In the theoretical part the following work were performed:-

1. Photography of Conferences giving to the students to a study lecture.
2. Attend the conferences using the translation services of the outstanding students in the course which speak fluently Spanish language.
3. Perform a writing evaluation test every Friday of each week.
4. Perform three study groups of 3 students each one.
5. Hand over a Certificate of Constancy of being passed the training in scrap collecting and classification.
Said certificates are signed by the Management of UNIDB and UNIDO.
6. Select the three best expositors at the end of the course.
7. Carry out an activity for the end of the course with all the students, instructors, the UNIDB Management and the UNIDO UNIDO.

To agree with the Head of the Training Program of UNIDB Mr. SUCANON Interpolice Mr. Evans G. ... to perform this special training in one daily hour, from 12:00 to 1:00 PM, from Monday to Friday.

In the training participated the following staff, Mr. General Manager of the Interpolice, Chief of Collecting, Chief of Transport, Chief of the Scrap Unit, etc., as well as other workers as weigh men, driver and other subjects involved in

Remarks

In the theoretical training we will be continuing to work on the cultural level so that we have to explain the importance of the

However, we do believe that the training attained the objective because of all the workers knew the practical work in scrap collecting and the content in the Conferences was totally related with the daily work of the students.

Final Evaluation of the Candidates Selected in 1953 and Evaluation of Separation from Military Service.

<u>Names</u>	<u>Grade</u>
1.- Guillermo de Souza	Excellent
2.- Guimaraes Da Costa	"
3.- Laurindo Francisco	"
4.- Miguel Costa	"
5.- Peire Abalencio	"
6.- Peire Cassco	"
7.- Moises Daniel	"
8.- Aurelio Neto	Approved
9.- Sebastiao David	"
10.- Jose M. Andrade	"
11.- Peire Vitacouri	"
12.- Paulo Francisco	"
13.- Antonio Costa	"
14.- Manuel Fernandes	"
15.- Jose Caiva	"
16.- Marcos Felipe	"
17.- Ricardo Valente	"
18.- Frederico Domingo	"
19.- Augusto Figueira	"
20.- Paulo Menete	"
21.- Miguel Alvarado	"

Excellent	7
Approved	14
Total	21

COURSES 3 TO 5

PROGRAMS

T H E O R E T I C A L - P R A C T I C A L

FOR BASICAL ELECTRICITY, ELECTRIC MAINTENANCE AND
MECHANICAL MAINTENANCE

COURSES OF BASICAL ELECTRICITY , ELECTRIC AND MECHANICAL MAINTENANCE.

These Courses were prepared and given based on the objectives stated by SUCANOR of:-

- To qualify workmen in electrical and mechanical maintenance and to give a knowledge on basical electricity.
- To improve and up to date the knowledgement of the Medium Level Technicians and University graduated personnel on basical electricity and electric and mechanical maintenance of modern equipment for scrap processing.

Organized in three courses, that is to say:-

- Basical electricity (course 3)
- Electric Maintenance (course 4)
- Mechanical Maintenance (course 5)

Each Course was given in two groups:-

- Group A: Medium and Higher Level Technicians
- Group B: Qualification of Workmen.

The total participants by courses were:-

<u>Courses</u>	<u>Group A</u>	<u>Group B</u>	<u>Total</u>
3	3	7	10
4	3	7	10
5	3	6	9

The quantities corresponding with the students that finished the trainings.

The teaching activity was carried out in conformity with the elaborated program which appear right after in this Annex. Also was performed the following:-

Individual Competitions

Competitions by study groups

Practical Competitions

The outstanding students of the course were mentioned and - congratulated.

A Certificate signed by the Enterprise Management and the UNIDO was handed over to the students have passed the courses.

Hereinafter will find the characterists of the courses, the - students and results.

C O U R S E 3

PROGRAM

BASICAL ELECTRICITY

COURSE OF BASICAL ELECTRICITY

OBJECTIVES OF THE COURSE

Instruct the students with elemental knowledge in basical -
electricity.

EXPLANATORY NOTE

This Program has a duration of 200 hours, 80 for theory and -
the rest for practices.

It will be performed in the installation of SUCANOR Enterprise
UEE Luanda Republic Popular of Angola.

Plan of the Teaching Process

Organism : State Committee for Technical and Material Supply

Specialty : Recovery of Raw Materials

Entrance Level :

Occupational : Stimulated by the Enterprise

Duration : 8 Weeks

Weeks by semesters 3 Weeks

<u>No.</u>	<u>Course of the Study</u>	<u>Total Hours</u>	<u>Weekly Periodicity</u>
I	<u>Theoretical Part</u>		
	Theoretic Information about the course of study	80	10/3
	Sub-Total	80	10/8
II	<u>Practical Part</u>		
	Only one part	120	15/3
	Sub-Total	120	15/8
	Total	200	25/8

Generalities

Specialty : Recovery of Raw Materials
Formation Method : Specialization
Course of Study : Basical Electricity
Period that Comprises : 8 Weeks
Lecture Weeks : 8 Weeks
Weekly Frequency : Daily
Total Hours : 22, Hours
Total hours for the
Course of Study : 200 Hours

Thematical Plan

<u>Unity</u>	<u>Thematic</u>	<u>Theoretical</u>	<u>Practical</u>	<u>Total Hours</u>
I	Introduction	6	6	12
II	Electrostatic	24	30	54
III	Conduction in metallic means and in semicon- ductors	16	24	40
IV	Magnetism	24	42	66
V	Transient and - oscillation	10	18	28
	Total	80	120	200

Analytical Program

<u>Unity</u>	<u>Thematic</u>
I	Introduction 1.1 Electrical Charge 1.2 Electrostatic field 1.3 Potential and Capacity 1.4 Laws
II	Electrostatic 2.1 Electrical field and electrical charges 2.1.1 Historic background of electromagnetism 2.1.2 Electrical Charges. Properties 2.1.3 Distributions of continuous charges. Charge density. 2.1.4 Electrostatic Field and Coulomb Law 2.1.5 Electric field intensity. Intensity Vector 2.1.6 Electrostatic field due to an accurate charge 2.1.7 Electric dipole. Field of a dipole. Dipolar moment. 2.2 The Gauss Law 2.2.1 Electrostatic field flow 2.2.2 The Gauss law 2.2.3 Charge distribution in a conductor 2.2.4 Applications of the Gauss Law 2.2.5 Electrostatic Potential 2.2.6 Electrostatic potential energy and conservatory character or such field.

Considerations

In this unity the fundamental conceptions of electricity are included for a better understanding of the materia.

In each unity the practice will be in corresponding with the theory.

Explain the conception of Electrical Charge, Electrostatic Field, Potential and Capacity, Also explain the principles properties of the dielectric and the Gauss and Coulomb Laws

The professor will explain the conduction of electrical current in defferent means and introduce the fundaments of the electrical circuit theory. Study the metal conductions, in vacumm and semiconductors, and making special emphasis in OHMN and Kirchhoff - Laws and their applications.

UnitsThematicConsiderations

- 2.2.7 Potential of a dipole and its behaviour in an internal field.
- 2.2.8 Potential gradient
- 2.2.9 Capacity of an isolate conductor
- 2.2.10 Condenser. Condenser capacity
- 2.2.11 Connection of a condenser in series and parallel
- 2.3 Dielectrics
 - 2.3.1 Behaviour of a dielectric in an electrostatic - field
 - 2.3.2 Electrical susceptibility. Absolute and relative permittivity.
 - 2.3.3 Dielectric effect over the capacity of a condenser.
 - 2.3.4 Dielectric electrostatic energy
 - 2.3.5 Nature of the electrostatic field.

III

Electricity conduction in metallic means and semiconductors

- 3.1 Conduction in metallic means.
 - 3.1.1 Nature of the metal charge bearers, Classical electronic theory
 - 3.1.2 Cause of the electrical resistance. Density and intensity of the current
 - 3.1.3 OHMN Law. Conductivity, resistivity and resistance.
 - 3.1.4 Joule-Lenz Law
 - 3.1.5 Electromotive force
 - 3.1.6 Circuit equation
 - 3.1.7 Kirchoff Law. Conduction in vacuum. Vacuum diode
- 3.2 Conduction. Energy band in conductors and isolators.

Study the conduction in metallic means, the nature of the charge bearers and basic electronic theory. Emphasis on the OHMN, Joule-Lenz and Kirchoff - Laws
Explain the conductors, semiconductors with different types

UnityThematicConsiderations

- 3.2.1 Conduction of semiconductors
- 3.2.2 Introduction. Energy band in conductors, semiconductors and isolators
- 3.2.3 Charge Bearers
- 3.2.4 Impurity in semiconductors
Type P and Type N
- 3.2.5 Temperature influence over the charge bearer
- 3.2.6 Connection P-N
- 3.2.7 Effects over the conduction

IV

Magnetism

- 4.1 Magnetic field
 - 4.1.1 Introduction. Magnetic induction vector
 - 4.1.2 Induction lines. Magnetic flows.
 - 4.1.3 Selenoidal nature of magnetic induction vector
 - 4.1.4 Magnetic force over a conductor with current
- 4.2 Sources of magnetic field
 - 4.2.1 Biot Law
 - 4.2.2 Field created by a large and straight conduct.
Biot and Sarat Laws
 - 4.2.3 Moment of a dipole and its behaviour in a magnetic field
 - 4.2.4 Ampere law
 - 4.2.5 Field of an ideal selenoide at any point of its axis
- 4.3 Electromagnetic induction
 - 4.3.1 Introduction of Faraday-Lenz law
 - 4.3.2 Determination of the Fem. Inducted in particular cases
 - 4.3.3 Mutual autoinductancy and inducancy
 - 4.3.4 Energy stored in a magnetic field
- 4.4 Magnetic properties of the substances

It shall be from the conception of magnetic field and analyse their objectives properties and characteristics.

- a) Explain the effects of a magnetic field and later on analyze the field of some basical structure such as current element, ring and selenoidal.

Also analyze from some examples the Biot and Ampere Laws, as well as their application

- b) Explain the main experiences in which are related the effects the electromagnetic induction and - name the Faraday law

Also it shall study the magnetic proprieties of the substances and their classification in: Magnetics, diamagnetics and ferromagnetics.

UnityThematicConsiderations

- 4.4.1 Behaviour of the substance in presence of a magnetic field
- 4.4.2 Magnetization current
- 4.4.3 Electronic explanation of the paramagnetism and diamagnetism
- 4.4.4 Intensity vector of the magnetic field. Ampere Circuital Law
- 4.4.5 Magnetical susceptibility and permeability
- 4.4.6 Ferromagnetism. Magnetic dominious
- 4.4.7 Hysteresis

v

Transients and oscilations

- 5.1 Analysis of RC circuits
- 5.2 Energetic behaviour
- 5.3 RL circuit, Energetic analysis and LC circuit energetic analysis
- 5.4 Analysis of RLC circuits. Energetic behaviour
- 5.5 Forced oscilations. Resonancy of charge
- 5.6 OHMN Law for alternal current circuit
Current resonancy

It will emphasized in the behaviour of the circuits, resistances, condensers and inductors connected to different typical circuits. Study of RC, RL, LC and RLC forced circuits (resistance, inductancy and condenser capacity)introducing the conception of current charge and resonancy. Introducing some basical conception to work with currents of alternal circuits such as Reactancy and Impedancy.

EVALUATION SYSTEM

I Partial Control 50 points

II Final Test 50 points

I Partial Control

Perform periodically partial control works

II Final Test

It will be done at the end of the course as Theory-Practical Evaluation.

Bibliography Reviewed

Electricity and Magnetism	ISPJAE	CUBA
Experiments in electricity and magnetism	ISPJAE	CUBA
Course of basical electricity	L. LANDAU	USSR
General Phisic	HOLLIDAY	USA
Technology of electricity	J. RAMIREZ	PORTUGAL

NAMES OF THE STUDENTS AND STANDING OBTAINED BY EACH ONE
APPROVED OR EXCELENT

<u>GROUP A</u>	<u>THEORY</u>	<u>PRACTICE</u>	<u>%</u>
Eng. Carlos Gatita	50	50	100
Techn. Victor Monteiro	50	50	100
Techn. N. da J. Joao	35	50	85

GROUP B

Simón D. Matías	50	50	100
Feliciano Elavoco	48	50	98
Santos Francisco	45	50	95
Alfonso Joao	45	50	95
Agostiño Pedro	47	47	94
Francisco M. Santana	48	45	90
Domingo Francisco	35	35	70

Total 10 students

From GROUP A - 2 EXCELENTS 1 APPROVED

From GROUP B - 6 EXCELENTS 1 APPROVED

C O U R S E 4

PROGRAM

E L E C T R I C A L M A I N T E N A N C E

OBJECTIVES OF THE COURSE

To attain the qualification of workmen through the studying of the Program Themes, as well as to improve and up to date the knowledge of technicians in maintenance activity of electrical equipment.

EXPLANATORY NOTE

This Program has a duration of 200 hours, 80 for theory and - 120 for practices.

It will be performed in the installations of SUCANOR Enterprise UER Luanda Popular Republic of Angola.

PLAN OF TEACHING PROCESS

Organism : State Committee for Technical and
Material Supply

Specialty : Recovery of Raw Materials

Entrance Level :

Occupational : Estimated by the Enterprise

Duration : 8 Weeks

Weeks by Semesters

8 Weeks

<u>No.</u>	<u>Course of Study</u>	<u>Total Hours</u>	<u>Weekly Frequency</u>
I	<u>Theoretical Part</u>		
	Theoretic information of the course of study	80	10/8
	Sub-Total	80	10/8
II	<u>Practical Part</u>		
	Only one part	120	15/8
	Sub-Total	120	15/8
	Total	200	25/8

GENERALITIES

Specialty	:	Recovery of Raw Materials
Method of formation	:	Specialization
Course of Study	:	Electrical Maintenance
Period that comprises	:	8 weeks
Lecture weeks	:	8 weeks
Weekly frequency	:	Daily
Total Hours	:	220 hours
Total hours of the course of study	:	200 hours

Thematic plan

<u>Unity</u>	<u>Thematic</u>	<u>Theory</u>	<u>Practice</u>	<u>Total Hours</u>
I	Introduction	6	6	12
II	Current circuits in their elements	16	16	32
III	Transformers, basical conception about electrical machines of rotatory three-phase and electrical motors	24	30	54
IV	Protection and installation of electrical motors	24	40	64
V	Measuring instruments	10	28	38
	Total	80	120	200

ANALYTICAL PROGRAM

<u>Unity</u>	<u>Thematic</u>	<u>Considerations</u>
I	Introduction	In this unity are relating the fundamental electric quantities, which with their corresponding definitions are the expression of the systems and electrical devices behaviour.
II	Current circuits and their elements 2.1.1 Fundamental definitions 2.1.2 Resistance. OHMN law 2.1.3 Kirchhoff Laws 2.1.4 Connection of resistance in series 2.1.5 Connection of resistance in parallel 2.1.6 Method of network current and branch 2.1.7 Simplification of the network. -Conversion of Star-Delta and Delta-Star 2.1.8 Thevenin Theorem 2.2 Voltage and alternate current 2.3 Phenomena 2.4 Alternate current circuit 2.5 Monophasic circuit of alternate current. Power and energy 2.6 Three-phase circuit balanced 2.7 Magnetic circuits	Study the basical conceits as well as the elements that comprise the electrical equipments, basis and functioning, also the electrical circuit theory.
III	Transformers. Basical conceits about the rotational electrical machines, three-phases and electrical motors	This unity studies the simple analysis of the principles in which is based the operation of electrical equipments and machines of the major application - and the secuency of the circuits of electrical motors

UnityThematicCoordinations

- 3.1 Transformers
 - 3.1.1 Magnetic circuits with alternate current, inductance phenomenon
 - 3.1.2 Ideal transformers
 - 3.1.3 Functioning of the real transformer with the secondary in open circuit
 - 3.1.4 Functioning of the transformer with charge
 - 3.1.5 Circuit test in transformers
 - 3.1.6 Efficiency
 - 3.1.7 Voltage regulation
- 3.2 Basic concepts about the rotatory electrical machines
 - 3.2.1 Fundamental phenomenon in electromechanical - conversion process of energy
 - 3.2.2 Classification of rotatory electrical machines
 - 3.2.3 Interaction of a magnetic field.
 - 3.2.4 Efficiency
- 3.3 Three-phase machines
 - 3.3.1 Operation principle of three-phase asynchronous motor
 - 3.3.2 Sizing
 - 3.3.3 Squirrel-double cage motors
- 3.4 Monophase motors induction
 - 3.4.1 Principle of operation
 - 3.4.2 Comparison between monophase and three-phase - motors
 - 3.4.3 Conception of synchronous impedance and excitation voltage, equivalent circuit.
 - 3.4.4 The effect of synchronous motor over the potential factor
- 3.5 Machines of direct current

Protection and installation of electrical motors

Study about the protection and installation of electrical motors, including the selection method of the breakers more used in the installation and operation.

- 4.1 Protection and installation of electrical motors
 - 4.1.1 Protection against short circuit, fuses and disjunctors "Breakers".
 - 4.1.2 Accessories necessary for the installations of electrical motors
 - 4.1.3 Starting method of electrical motors
 - 4.1.4 Code Documents
 - 4.1.5 Service factor (SF)
 - 4.1.6 Maximum demand
 - 4.1.7 Factor of demand (DF)
 - 4.1.8 Determination of nominal current for different electrical and rotatory machines
 - 4.1.9 Calculation of overload thermal protection
 - 4.1.10 Calculation of protection against shortcircuit
 - 4.1.11 Selection for the isolation conduct
 - 4.1.12 Gage selection of an electrical conduct, attending the heating condition
 - 4.1.13 Section of the feeder for different branch circuit
 - 4.1.14 Calculation of the disjunctors or "Breakers" of the feeder protection
 - 4.1.15 Selection of tubes
- 4.2 Electromagnetic control of electrical motors
 - 4.2.1 Relays
 - 4.2.2 Contacts
 - 4.2.3 Diagrams of electrical circuits
 - 4.2.4 Some circuits designed for the operation of electrical motors
- 4.3 Industrial systems of energy distribution
 - 4.3.1 Centres of charge

UnityThematicConsiderations

- 4.3.2 Unitarian sub-stations
- 4.3.3 Radical A system
- 4.3.4 Radical B system
- 4.3.5 Radical C system
- 4.3.6 Radical system with secondary selectives

v

Electrical measuring instruments

- 5.1 Electrical measuring instruments
 - 5.1.1 Types of lamps
 - 5.1.2 Core settings
 - 5.1.3 Instruments of direct measurement
 - 5.1.4 Amperemeters
 - 5.1.5 Voltmeters
 - 5.1.6 Wattmeters
 - 5.1.7 OHMMeters
 - 5.1.8 Measuring instruments by comparison
 - 5.1.9 Transformers of instruments

A strict study of the principle functioning of electrical measuring instruments that it is considered more important from the technical objectives.

EVALUATION SYSTEM

I Partial Control 50 points

II Final Test 50 points

I Partial Control

Perform periodically partial control works

II Final Test

It will be done at the end of the course as theory-practical evaluation.

BIBLIOGRAPHY CONSULTED

Physical General	TIKOREVA	USSR
Physical General	L. LANDAU	USSR
Physical General	P. Grand	Cuba
Electrical Circuits	P. Angelo	USA
Electricity and Magnetism	ISPJAE	Cuba
Experiments of electricity	ISPJAE	Cuba
Manual of Electrotechnics	ISPJAE	Cuba
Laboratory practice of electricity	ISPJAE	Cuba

NAME OF THE STUDENTS AND STANDINGS OBTAINED BY EACH ONE
APPROVED OR EXCELENT

<u>GROUP A</u>	<u>THEORY</u>	<u>PRACTICE</u>	<u>%</u>
Eng. Carlos Gotita	50	50	100
Techn. Victor Monteiro	50	50	100
Techn. Ngola J. Joao	35	35	70

GROUP B

Simon D. Matias	50	50	100
Santos Francisco	50	47	97
Francisco Santana	50	44	94
Alfonso Joao	42	50	92
Feliciano Elavoco	47	47	94
Domingo Francisco	41	46	87
Agostiño Pedro	43	40	85

Total 10 Students

From GROUP A 2 EXCELENTS 1 APPROVED

From GROUP B 5 EXCELENTS 2 APPROVED

C O U R S E 5

PROGRAM

M E C H A N I C A L M A I N T E N A N C E

COURSE OF MECHANICAL MAINTENANCE

OBJECTIVES OF THE COURSE

To attain the qualification of workmen through the studying of the Program Themes, as well as to improve and up to date the - knowledge of the technicians in the activity of mechanical maintenance.

To know the fundamental definitions and basic concept about - mechanic, measuring instruments, and also the documentation system of mechanical maintenance.

To interpret the properties and characteristics of the metals, metal alloys and some metallurgical process.

To determine through the studying of elemental unities that form together equipment and apparatus which as a science receive the name of Machines Elements.

To achieve the basic knowledge about the hydraulic of oil, for its application in machines and other hydraulic system.

To apply the knowledge acquired from the previous objectives in the maintenance of mechanical equipments, as a protection system, in order to extend the useful life of the equipments.

EXPLANATORY NOTE

This Program has a duration of 300 hours, from them 100 are theory and 180 for practical.

This will be performed in the installations of SUCANOR Enterprise UFE Luanda Popular Republic of Angola.

PLAN OF THE TEACHING PROCESS

Organism : State Committee for Technical and
Material Supply

Specialty : Recovery of Raw Materials

Entrance level :

Occupational : Estimated by the Enterprise

Duration : 12 weeks

Weeks by Semesters 12 weeks

<u>No.</u>	<u>Course of Study</u>	<u>Total Hours</u>	<u>Weekly Presence</u>
I	<u>Theoretic Part</u>		
	Theoretical information of the course of study	120	10/10
	Sub-Total	120	10/10
II	<u>Practical Part</u>		
	Only one part	180	15/12
	Sub-Total	180	15/12
	Total	300	25/22

GENERALITIES

Specialty	: Recovery of raw Materials
Method of formation	: Specialization
Course of Study	: Mechanical maintenance
Period that comprises	: 12 weeks
Weekly frequency	: Daily
Total hours	: 320 hours
Total hours of the course of study	: 300 hours

THEMATICAL PLAN

<u>Unity</u>	<u>Thematic</u>	<u>Theory</u>	<u>Practice</u>	<u>Total Hours</u>
I	Introduction	8	10	18
II	Knowledge of metal technology	30	40	70
III	Elements of machines	20	30	50
IV	Knowledge of Oleo- - hydraulic	40	50	90
V	Protection of mechanical equipments	8	20	28
VI	Lubrication	14	30	44
	Total	120	180	300

ACADEMICAL PROGRAM

<u>Unity</u>	<u>Thematic</u>	<u>Considerations</u>
I	Introduction 1.1 The mechanical maintenance 1.2 Types of maintenance 1.3 Documentation for maintenance 1.4 Main damaging causes to mechanical equipment 1.5 The friction as damaging cause to mechanical equipment 1.6 Fundamental conceit of mechanic 1.7 Summary of the geometric and mechanical magnitudes 1.8 Unities of the geometric and mechanical magnitudes 1.9 Localization of breakdown 1.10 Practical demonstration of the chapter	This unity will include the following: - Importance of the mechanical maintenance, the maintenance method, and documentation. - Measuring instruments, longitude measurement and fundamental conceit and definitions of the mechanic The practical and technical evaluation shall be at the end of the chapter At the end of the chapter the practice shall be performed
II	Comprehension of the metal technology 2.1 Introduction. The metal and its proprieties 2.2 Cast Iron 2.3 Fundamental conceit of steel production 2.4 Processing with SUCATA 2.5 Steel types 2.6 Metallic alloys 2.7 Ferrous alloys 2.8 Thermal treatment of steel and foundry 2.9 Metal treatment with pressure 2.10 Laminated 2.11 Forged 2.12 Welding by electrical arc 2.13 Welding by contact 2.14 Autogenous welding	To study the properties and characteristics of metals, metal alloys and some metallurgical process such as - welding and thermal treatment Visit to the centres in order to obtain experiences from there as a documental element in the activity At the end of the chapter, the theory and practical - evaluation shall be performed

Unity	Thematic	Considerations
2.15	General concept on the elaboration of cold metals	
2.16	Practical classes	
III	Machine elements	The study of pieces as element units which form the equipments and apparatus, as well as some means in order to achieve such objectives.
3.1	Criteria on the work capacity and calculation of machine elements	The theory and practical evaluation shall be performed at the end of the chapter
3.2	Couplings of machine elements	
3.3	Type of couplings and their characteristics	
3.4	Transmission	
3.5	Transmission and character types	
3.6	Transmission by friction	An intermediate test shall be done in order to evaluate the knowledge acquired by the students in the program given
3.7	Transmission by belt	
3.8	Transmission by gears	
3.9	Transmission: conical, helicoidal and others	
3.10	Axe and shaft, couplings and bearings	
3.11	Mechanical springs, pieces and framework	The analysis of elements will be included in the practical classes, as per the unities studied.
3.12	Practical classes	
IV	Knowledge on oleohydraulic	This chapter will give basical aspects about the flow circulation in oleohydraulic circuits to command the press and hoisting systems.
4.1	Introduction	
4.2	Simple hydraulic system	
4.3	Mechanical pumps	
4.4	Protection against overload	The theory-practical unity will be evaluated at the end of the chapter
4.5	Command devices	
4.6	Filters and filtration	
4.7	Hydraulic flows	
4.8	Hose and flexible pipes	
4.9	Manometers maintenance	
4.10	Hauling and pipe installation	
4.11	Packing joints and gaskets	
4.12	hydraulic deposits	
4.13	Maintenance of hydraulic systems	

Unity

Thematic

- 1.14 Cranes
- 1.15 Presses

V

Protection to mechanical equipments

- 5.1 Preventive maintenance
- 5.2 Repairing maintenance
- 5.3 Capital repairing
- 5.4 Localization of breakdown

Analysing the technical aspects of mechanical maintenance, the maintenance system and some other matters that limit the useful life of the equipment.

It will emphasize in the maintenance system and the subsystem with regimen control.

The theory-practical knowledge will be evaluated on unity given

VI

Lubricants

- 6.1 Introduction
- 6.2 Lubrication and friction
- 6.3 Characteristics of lubricants and the meaning of laboratory tests
- 6.4 Bearings and their lubrication
- 6.5 Gearing and their lubrication
- 6.6 Application of lubricants

Study the lubricant employs as a means of protection to mechanical equipment metallic, as well as its better use in the mechanized systems as a source of energy decrease which loss by friction effect

EVALUATION SYSTEM

I Partial Control 50 points

II Final Test 50 points

I Partial Control

Perform a didactical partial control

II Final Test

It will be done at the end of the course as Theory-Practical Evaluation.

REFERENCES CONSULTED

General Physics	LIMOREVA	USSR
General Physics	SEARS	USA
Technology of metal	MALISHEV	USSR
Technology of metal	SARL	PORTUGAL
Material Resistance	MALISHEV	USSR
Technology of metal	ISJAE	CUBA
Manual of Oleohydraulic	SARL	PORTUGAL
Lubricants	E. A. GARCIA	CUBA

NAMES OF THE STUDENTS BY GROUPS AND STANDING OBTAINED BY EACH ONE
APPROVED OR EXCELLENT

<u>GROUP A</u>	<u>THEORY</u>	<u>PRACTICE</u>	<u>%</u>
Eng. Carlos Getita	50	50	100
Techn. Victor Monteiro	50	50	100
Techn. Jose Ambrosio	47	50	77

GROUP B

Pedro Utacaiain	50	50	100
Domingo J. Sola	44	50	94
Francisco Santana	43	50	93
Eduardo Pindi	45	45	90
Domingo G. Lima	35	38	73
Pedro Malanga	35	38	73

Total 9 Students

From GROUP A - 3 EXCELLENTS

From GROUP B - 4 EXCELLENTS 2 APPROVED

R E C O M M E N D A T I O N S

TO THE EXECUTIVE BOARD

OF THE ENTERPRISE

PROPOSAL FOR COMPLETION OF THE ENTERPRISE

ACTIVITY

PROPOSAL FOR NEW EQUIPMENTS AND INSTALLATIONS

RECOMMENDATION TO THE MANAGEMENT STAFF OF THE ENTERPRISE

1. STORAGE OF THE OXYGEN AND ACETYLENE CYLINDERS

We urgently recommend, to resolve the storage of the oxygen - and acetylene cylinders, since that the cylinders could not be stored as they are actually now, placed direct on the ground, outdoor and transporting them horizontally in the trucks.

It is necessary to prepare an area with steel or concret floor, and with a simple roof in order to avoid the sun ray directly and transport them standing or vertically.

Besides, to prevent the contact of the cylinders, in special - the oxygen, with oil, greases and paints.

We do believe that this situation shall be solved immediately

Also we recommend to the workers, the wearing of the human protection means since that when we arrived they had not anything, nor gloves, boots, breast-plate, leggings, etc. Establish a suitable control in order to avoid losses of the protection means after being given to the workers.

2. NON-FERROUS METALS

We recommend, due to the high value of this scrap, to commence urgently the work of collecting and classification of scrap.

We know that there are difficulties with the transport and it is necessary to coordinate the recovery of non-ferrous materials; we also propose to resolve a truck with a crane for this activity; A crane truck of 10 to 12 MT of capacity with a grip of 1 MT, so this work can be done without any problems. We remark that the non-ferrous scrap has a present value of up to 10 times higher than the value of the ferrous scrap with less volume.

Besides, in SUCANOR the area can be clean to store this classified scrap, and to be used either for domestic or exportation.

TO THE PRODUCTION CHIEF

1. Have the control of all suppliers of ferrous and non-ferrous scrap.
2. Make a contact with all the suppliers in order to preserve the scrap and not mix up them, including in the yard of SUCANOR Enterprise.
3. Know approximately the monthly produced quantity and the type of them.
4. Explanation of what a quality standard is and the obligations to bring with it after being approved by the state, either for the suppliers or whose process the scrap.
5. Elaborate the models for all the statistical controls

TO THE TRANSPORT CHIEF

1. Control the transport exploitation to the maximum, for avoiding to transport empty or half-empty.
2. Control the transport route in order to prevent unnecessary fuel consumption.
3. Guarantee the technical maintenance planned to the equipments to keep the motor transportation in optimum conditions.
4. Specialize the workmen and the drivers in the scrap hoisting and loading works to obtain a better profit and minimum breakages.

TO THE YARD CHIEF

1. Correct location of the oxicutters to look for a greater productivity in the cutting by flame.
2. Have the scrap prepared to supply the press-shear guaranteeing the daily production.
3. Guarantee that the transportation equipments to dump the scrap in a place where the productive process will be not interrupted.
4. Check the material daily to ensure the production, for example: oxygen, acetylene, hydraulic liquids, spare blowtorch, hoses, etc.

PROPOSAL FOR COMPLETION OF THE ENTERPRISE ACTIVITY

ADMINISTRATIVE AREA

1. ONE COMMERCIAL SECTION

It is necessary to select two workers who will be the coordinators from outside (recovery).

WORK FUNCTION

Localize in each Ministry, the factories and workshops that produce scrap from their technological process. Determine the scrap types: light, heavy, cast iron, etc. and the approximately tonnage that produce in the month, also the non-ferrous scrap shall be included, -- open a control or Kardex by each supplier in order to have a supplier census and the tons average, for preparing in a near future the official contracts for the recovery and delivery.

By this census the coordinators could establish the recovery cycle in each factory and the scrap type to be collected, that is to say, direct to the Siderurgic of to SUCANOR processing yard.

Establish with each supplier the conservation of non-ferrous and ferrous scrap, to let know the Manager, the centre political organizations, the Party, Labor Union, etc. about the importance of scrap, which is a synonymous of richness.

Coordinate with the transport chief a planned collecting in accordance with the data arising from the investigations.

When the collecting will be in a determined place, for example; - cast-away scrap, it is necessary to dispose of a truck (special), an oxycutter, one helper, etc., and also determine, according with the experience acquired in each place, the time needed for the collecting.

To be the intermediary between SUCANOR and the suppliers with regard to the economical situations and the payment of the scrap in keeping with the quality. We proposed two workers: one for attending the -- north part and the other the south of Luanda.

We understand that the work shall be carried out by these coordinators, need a motor transport, motorcycle, automobile, etc. if it is possible, to make good use of the time. They should have a clerk to guarantee all the bureaucratic works, the control of Kardex, suppliers, etc., and shall be a clerk specialized in statistics.

This section shall be under the direction of the SUCANOR Production - Assistant.

These coordinators should have a such scholar level since they will in charge of serious works to do.

These coordinators together with the Production section shall elaborate the documents or standards that shall rule the collecting, preparation, storing and commercialization of scrap in Angola.

2. TECHNICAL ADMINISTRATION. PROTECTION AND HYGIENE.

A technician of Work Protection and Hygiene shall work in - SUCANOR Enterprise.

This technician shall control the necessary dispositions on the human protection means.

He shall select the needful protection means taking into - considerations the useful live of them.

Initiate in each working post, a dossier with the obligations that shall be observed by the workers and adding the necessary protection means in order to perform the specific work. This Instruction Act shall be signed by the workers as a documentary proof that they were due instructed and received the necessary protection means for the work; this is important for any accident investigation, since they can happen due to unsafe conditions of the workers for not wearing the protection means in - each specific working post.

He shall coordinate with each Chief of Brigade, the inspection of their personnel for being sure that they are wearing the - protection means, which are the Chief of Brigade responsibility.

3. THE HYGIENE OF THE WORKING CENTRE

This technician should inspect the unsafe conditions that may exist in the Centre. For instance, the water entry in the cable channel of the portal crane.

Determine the smoking areas, the limited access, electrical area, storaging, etc., extinguisher areas either for electrical and non electrical fires.

Create a fire brigade with personnel of SUCANOR, composed of a chief and the members, in coordination with the Municipality - Department of Fire Prevention with the idea that this Brigade receive the course against fire and being instructed.

Inspect the hygiene in the kitchen, requiring and imposing the hygiene ryles for the elaboration and serving the food.

To check in general the total hygiene of the centre avoiding focus deseases to the workers and the neighbouring.

Coordinate the annually medical check to all the workers in order that they have the up to date health certificate, this coordination can be done with the nearest policlinic or hospital.

Require the tetanic toxoide vaccination for all workers of SUCANOR because of they work with metals.

BIDAL FOR NEW EQUIPMENTS AND FACILITIES

1. Acquire a portable grab shear, we understand that this shear will be of a great useful in STONOR, for the processing of metallic residues from the construction.

For instance: shears of different sizes, angulars, pipes of small thickness, etc.

Also it can be used in the preparation of non-ferrous metals.

For example: aluminium angulars, aluminium tubes, brass bars of different types, etc.

2. A portable shear for the processing of non-ferrous scrap; this equipment shall be able to impact the wire, tubes and sheets - sheets, aluminium, brass, etc.

With this, it is obtained a better weight and less volume, - therefore an optimum transport exploitation, besides if there is a good classification it will obtain a best product price of high quality in the selection of the non-ferrous scrap.

3. Construct a warehouse with the step down and storage of the store equipments, pieces and materials used.

We understand that with the economical situation that the Country has, this will be a way to cut out importations.

For that, it is necessary to have a specialist in this matter, in order to recovery everything in a way that it is possible to use again.