

Project name:

“Improving the research capabilities on environment pollution by modernizing / extending the current infrastructure”

Financing contract : **No. 156/CP I/ 12.08.2008**

Programme : **Capacități**

Project type : **PI – CD: Investment projects**

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Main objective of the project:

The project is part of the strategic objectives and priority directions defined by the National Strategy for RD’ for the period 2007 -2013, implemented through the programs of the National Plan for RD’ (PN II).

The project runs as part of the program called “ Capacități” intended to develop the research capabilities and to open the RD’ system towards the international scientific world and to the national social and economic media.

The main objective of the project:

Developing the research – development – innovation capabilities of the specialized laboratory at INCD – INSEMEX Petroșani by modernizing / extending infrastructure in the “environment” Aprior domain for increasing its share to the expanding of economic competitiveness and to the development of a sustainable Knowledge based economy.

Specific objectives of the project:

- Modernizing and extending laboratory infrastructure, laboratory acquiring more than 50 years experience in the prior domain “Environment”;

- Improving the quality of laboratory tests on controlling the pollution level of the environment parameters through the purchase of highly performing equipment, reaching the quality level stipulated by the European Union, as well through the implementation of the analysis /test methods harmonized with the European ones that meet the general and the specific performance requirements.

- Extending the test range and increasing the competitive level by improving the provided test and research services on environment issues;

- Extending the accreditation of the expert laboratory provided by RENAR by including the new tests in the domain of competence of the new package covering the test procedure.

Measures to be taken to fulfill the objectives of the project

- Increasing the research the utilization of the current research infrastructure;
- Expanding the research infrastructure through the purchase of new laboratory equipment

a) Equipment purchased in 2008:

DIONEX ICS -3000 ion –chromatograph system



DIONEX ICS -3000 ion –chromatograph system Equipment purchased in 2008]: is used to determine the concentrations of cations (Li^+ ) and of anions (F^- ) from : surface waters, waste waters, soils, muds, sludges.

Technical data :

DIONEX ICS -3000 ion –chromatograph system: is made of the jollowing component parts :

- ICS 3000 DP (pump compartment)
- ICS 3000 EG (eluent generating compartment)
- ICS 3000 DC (detectors compartment) that comprises.

Conductivity detector for anions:

- ASRS 300 – 4 mm supsressor for anions

Chromatograph pre – column and column for anions

Conductivity detector for cations:

- CSRS 300 – 4 mm supsressor for cations

Chromatograph pre – column and column for cations:

- ICS 300 AS – automatic sampling system PC, software for Chromeleon system.

1. ICS 3000 DP – pump compartment

Flow rates between 0,001 and 10,0 ml /min. and pressures reaching 35 MPa (3500 psi), PD/PS.

The selected elution system can be provided by the pump, either as isocratic mixture of solvents, or linear, stepwise, continuous or a combination of all these.

2. ICS 3000 –EG (eluent generating compartment).

It generates alkali eluents directly from deionized water. EG can be settled for operations on a canal. The canal comprises:

- a programmable high precision power supply
- a device for high pressure removal of electrolysis gases resulted during the generation of eluent
- a single –use EluGen cartridge to generate the eluent. Each cartridge comprises 900 ml of the suitable electrolyte

- a trap column that regenerates on continuous basis (CR –TC) to remove all the contaminants which can come from the deionized water, CRTC regenerates electrolytically, aspect that allows to operate during analysis.

3. ICS – 3000 (DC) Detector /Cromatography Module

The module Detector for Cromatography provides a suitable environment with controlled temperature for ICS -3000 chromatographic component elements. The module can accommodate the component elements for two canals.

The following component elements are installed in the DC:

- conductivity detector;
- electrochemical detector;
- injection valves ;
- separation columns; and
- suppressors and precolumns.

4. ICS – 3000 AS – Automatic sampling system displays a solid state structure, with full options that can deliver accurately sample volumes between 1,0 and 99,9 µl or from 100 to 1000 µl of an injection valve. The automatic sampling system is a sample loader, with no metallic component elements, intended for ion –chromatography applications. It can deliver between 0,2 and 5,0 ml of sample in presettled increments. Each bottle contains material sufficient for three injections maximum.

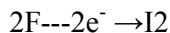
b) Echipment purchased in 2009:

Karl Fisher titrator



This equipment uses the coulometric method to determine humidity. The measuring range of the products humidity is between 0 and 5%. The equipment has been adjusted to determine humidity for ammonium nitrate but it is possible to determine humidity for other substances whether the concerned substance is soluble in organic solvents.

The amount of water in the test Nem Shall be determined by measuring the current necessary for an electrochemical generation of iodine from the iodide, through electrochemical oxidation.



The Touchscreen is friendly use; it displays protection for the Keyboard.

Technical data

- ambient conditions → ambient temperature: + 5 °C ÷ + 40 °C;
- Stirrer /pump → Stirrer and pump detection system;

- Built in magnetic stirrer;
- Extraction adapter.

Configuration of Karl Fisher titrator and description of constructive elements

Part	Description
A	Waste bottle drying tube
B	Waste bottle
C	Solvent manager
D	Titration arm
E	Measuring cell
F	Built in magnetic stirrer
G	On / off button
H	Touchscreen
I	Generator electrode
J	Double platinum pin electrode
K	Extraction adapter and park sleeve

- **Seven Multi S47 multiparameter : pH –meter, conductivity expansion unit.**



The instrument is used to determine the pH and the conductivity of solutions.

Technical data:

- for pH module:
 - measuring range: 0,00 ÷ 14,00;
 - accuracy : + / - 0,01
- for conductivity module:
 - conductivity : 0,01 μ s /cm up to 1000 ms /cm;
 - TDS : 0,1 mg /L up to 1000 g /L; Factor: 0,40 up to 1,00
 - Salinity : 0,00 up to 80,00 ppt;
 - Resistivity : 0,00 up to 20,00 M Ω CM;
 - Temperature : - 5 °C up to 130 °C.
- Accuracy : + / - 0,5 %.

- **XS 205 analytical balance**



Dr XS 205 analytical balance is used to weigh masses.

It uses an integrated software that can be upgraded any moment with the help of E – Loader software and of a PC connected to the internet.

It allows an automatic internal calibration (adjustment) and zero setting and external adjustment. It has a touchscreen, an illuminated, graphic easy to use display.

It has several built –in applications, such as: adaptation of weighing to the ambient conditions, percent weighing, piece counting, determining density, dosing of substances, calculation with factor, possibility, to display different measuring units, adjustment possibility to input identifiers for test items.

Technical data

- Measuring range
 - Maximum weight, fine range: 81 g
 - Accuracy: +/- 10 – 5 g
 - Maximum weight: 220 g
 - Accuracy: +/- 10 – 4 g

- **MS 1602 precision technical balance**



MS 1602 S precision technical balance is used to weigh masses. It is equipped with a high contrast display (HCD) large numbers and clear symbols. The friendly use menu provides an easy operation of the balance and the metallic enclosure has a high chemical resistance. It is provided with internal adjustment capabilities and protection for the Keyboard.

Technical data:

Measuring range:

- Maximum weight : 1620 g
- Accuracy : +/- 0,01 g

- **Heidolph rotary evaporator**



Heidolph rotating evaporator is used for the distillation of solutions. It has a heating bath with very short heating periods.

Digital display of the rotation speed, vapours temperature and temperature of the heating bath.

Technical data:

- Rotation velocity: 20 – 270 rpm;
- Digital speed setting;
- Heating power : 1300 W;
- Heating bath range: 20 – 180 °C;
- Protection to an excess of temperature: 190 °C;
- Setting temperature of the heating bath: --
- Evaporation rate : 1000 ml H₂O /h
- Cooling surface : 1200 cm².

The rotary evaporator is equipped with a Rotovac vacuum pump with diaphragm. When connected to the rotary evaporator, it is possible to control the vacuum source with the help of the VAC (vacuum automatic control) that comprises three displays (current vacuum, presettled vacuum and). It is possible to diminish pressure during distillation.

- **Tuttnauer autoclave**



Tuttnauer 2540 autoclave is a semi-automatic sterilizer designed especially for the sterilization of liquids such as nutritive liquids and buffer solutions, different plastic items, wastes. The sterilizer has three basic programs and the operating manner and the parameters have to be settled in relation to the material subject to sterilization. The electronic timer used with this sterilizer starts to count down the time elapsed from the moment when the parameters settled by the operators are reached and cuts down the heating process when the sterilization cycle ends. It allows to shorten the sterilization period.

Technical data

- Microswitch control;
- Automat water supply from the inbuilt reservoir;
- Start of the sterilization cycle with the temperature sensor into the reference flask;
- Recycled discharge: the condensed steam is re –sent into the supply reservoir;
- High accuracy temperature control and manual calibration with a resolution of 0,1°C;
- Temperature and pressure are permanently monitored;
- Sound and visual warning;
- Two line digital display;
- Flexible temperature probe inside the sterilization chamber.

● **Hach Lange laboratory turbidimeter**



The instrument is used to determine turbidity of:

- Surface waters;
- Used waters;
- Underground waters.

Turbidity means a diminution of the liquid clearness due to the undissolved waters. Turbidity measured with the help of this instrument is expressed by nephelometric turbidity units (NTU), units of nephelos (FNU) or EBC units (European Brewery Convention).

The upper limit is 4000 NTU.

Technical data

2100 AN is laboratory turbidimeter is a nephelometer for measuring scattered light. The optical system comprises a 870 ± 30 nm light emitting diode (LED) assembly, a 90 °C detector to monitor scattered light, a forward – scatter light detector, a transmitted –light detector and a backward –scatter light detector.

The instrument displays the following specific features:

- Accuracy:
 - $\pm 2\%$ of the reading plus 0,01 NTU from 0 – 1000 NTU; $\pm 5\%$ of the reading from 1000 to 4000 NTU; $\pm 10\%$ of the reading from 4000 to 10000 NTU.
- Absorbance (photometric limarity):
 - $\pm 0,005$ A from 0 to 1 A at 860 nm.
- Resolution:
 - 0,001 NTU /FNU /EBC.
- Repeatability:
 - $\pm 1\%$ of the reading or $\pm 0,01$ FNU.
- Operating temperature: 0 – 40 °C.

2100 N turbidimeter provides a long – term stability and there is no need for frequent calibration. In relation to the number of test items (more than 30 test items), calibration can be repeated.

● Nabertherm Kiln



The Kilns in this series are specially intended for burning purposes and for ash determination. The air is pre-heated before entering the burning chamber and there is a good temperature distribution even at 5 air changes per minute.

General description:

- $T_{max} = 1100\text{ }^{\circ}\text{C}$;
- Stainless steel housing;
- Double-walled housing for a better temperature stability and lower temperature on the outside;
- Silent electric contactor.

Description of B 180 controller:

- Friendly use, protected Keyboard;
- Accurate programming of $1\text{ }^{\circ}\text{C}$ stepwise, 1 minute respectively;
- Adjustable time for a heating ramp;
- It can be presetted to start operating at a certain moment;
- It can be calibrated;
- It displays a self-adjusting function;
- Meter for the consumed power.

● Microscope Leica DM500



EZStore™ design with **integrated handle and cord wrap** allows easy carrying, easy lifting and protection against microscope component damage.

c) Equipment purchased in 2010

- Instrument to determine flammability point –PENSKY MARTENS – with automatic sealed vessel



Application

- Determination of flammability point of combustible liquids, of liquids with solid waters in suspension, of liquids with tendency of formation of a thin film at surface during testing and of other liquids.

Applicable testing methods:

- Method A is used to determine the flammability point of paints and varnishes that don't form a film at surface of un –used oils and of other oil products not covered by method B.
- Method B is used to determine the flammability point of residual fuels, diluted bitumen, waste lubricant oils, of liquids with tendency of formation of a thin film at surface, of liquids with solid waters in suspension and of materials with high viscosity, such as polymer –type solutions and adhesives.

Technical data

- Temperature range: - 10+ 400 °C
- Programs : - 8 programs in accordance with the international standards (4 in accordance with ASTM and 4 in accordance with ISO);
 - 2 programs for rapid heating;
 - 2 searching programs for the determination of the estimated flammability point;
 - 2 programs that can be settled by the user with typical ignition temperatures.
- Stirring speed: 120 and 250 r.p.m.
- Detecting the ignition temperature: differential thermocouple
- Ignition: electric and by gas, both included
- Air pressure: automatic barometer correction
- Housing: stainless steel resistant to corrosion
- Electric supply: - 230 /115V, 50 /60 hz
 - can b selected by the user
- Current consumption: 900 W
- Interface: RS 232 for the printer
RS 232 for the PC.

Concrete results envisaged to be attained at the end of the project:

- development of the material research base of the expert laboratory at INCD INSEMEX Petroșani, including at regional and national level;
- expanding the test range at the EU quality level, together with the accreditation of these tests, aspect that shall improve the visibility of the institute;

- increasing the reliability of test methods by using PC assisted methods and the processing of data with the help of expert software for each test equipment;
- increasing the of measurement at the same time with the decreasing of measurement uncertainty of the quality indicators related to the environment parameters during specific laboratory tests due to the implementation of the methods harmonized with the European norms and, implicitly, decreasing the human errors;
- creating new opportunities for an efficient monitoring of the market, the results leading to an improved quality level;
- high reputation that can be reached by the expert laboratory of INCD INSEMEX Petroșani at regional, national and even international level the laboratory shall be part of RENAR network and shall operate under the jurisdiction of this national body;
- increasing the number of beneficiaries from the scientific and economic media that are going to take advantage of the research and test results.

Social and economic impact of the project

There is envisaged a positive impact as the environment parameters are going to be monitored and improved through the development and implementation of a complex program that shall comprise a social and economic mechanism to prevent and fight against environment pollution.

Subsequently, there shall be recorded on economic development of people's health, especially of those living in highly industrialized areas. The gathering, storage and processing of information in relation to the water, soil and air poisoning with different pollutants shall be highly improved and shall have an impartial character.

These operations shall be performed in the laboratory with the help of the equipment purchased during the run of the project.

Knowing the pollution level of water, soil and air and the use of these information in the programs drawn up by industrial enterprises, as well in the health programs comprise the development of an education strategy, both of workers involved in the economic media and of population, even of social marketing with the view to the modifying of behaviours of persons exposed to pollutants. This aspect comprises the development of certain educational programs and the involvement of the whole local community. There shall be a better and full information of the public over the problems created by the contamination with polluting substances, especially with pollutants that can produce cancer. The trust of population in the information related to the environment pollution shall increase.

Advantages of the project:

- advantages acquired at national level due to the increment of the number laboratories expert in environment analyses;
- advantages acquired by the Romanian economic agents that take benefit of the research activities, environment tests that can provide an increment of the prevention and control level of environment pollution, as well an efficient protection of the surrounding environment, susceptible to be destroyed by the pollutants generated by human activities.
- Advantages acquired by INCD INSEMEX Petroșani by adjusting the research infrastructure to the requirements of a prior domain that registers an accentuated tendency to development and to increase competitiveness.

Target groups:

- Researches and experts involved in the "Environment" domain;
- Experts working in the Environment Laboratory accredited by RENAR;
- Other experts in the scientific and economic domains.

Beneficiaries of the project:

- Economic agents that carry on activities that generate pollutants adversely affecting the environment factors (air, water, soil);

- Similar laboratories by taking part in inter – laboratory comparisons;
- Institutes that are part of the national research system.

Access program: permanent working hours during the INCD - INSEMEX (Monday-Friday 07-15)
Available documentation: Technical leaflets appliances, working with other specific equipment and procedures developed by the team of specialist

Conditions / access costs: labor costs and access to third parties for equipment purchased will be determined by the cost of supplies, pay staff their exploits, maintenance costs

Staff:

Personnel that will use the equipment is the team's technical staff of physico-chemical laboratory of the INCD INSEMEX:

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Following infrastructure development through the acquisition of the 12 laboratory equipment, the competence of the laboratory was filled with the following tests:

- Test procedure "Turbidity determination, PI-46 code;
- Test procedure "Moisture determination of ammonium nitrate, PI-47 code;
- Test procedure "Determination of pH and electrical conductivity, PI-48 code;
- Test procedure " Asbestos fiber determination, code PI-04;
- Test procedure "Determination of Anions (fluoride, chloride, bromide, nitrates, sulfur, phosphates) and cations (lithium, sodium, potassium, calcium, magnesium, ammonium), PI-45 code.

Test procedure "FLAMMABILITY TESTING FOR DETERMINING PARAMETERS OF A GAS, VAPOR AND FLAMMABLE LIQUIDS, PI-Ex-12 code.

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