

E!1617 EMS EUREKA PROJECT. COMPUTING SYSTEM FOR CONTINUOUSLY EMISSION MONITORING

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The project represents a modular and open system for the burning processes to steam generators with fossil fuels, integrated in technological and automation structure.

System general features

- Noxious Emissions Monitoring, according with European Legislation;
- Energy Efficiency Improving, using Mathematically Modelling of the physical and chemical phenomena during combustion processes with fossil fuels;
- Expert Systems function for generating burning parameters optimum values;
- Graphical - Mathematical Visualization;
- The joint optimisation of both thermal efficiency and emission reduction;
- On line plant advisory system for the operators and managers;
- Didactic simulator for operator's training in the efficient electric generation;

The system has 2 main modules:

SMARTFAG: module for emission monitoring system

This module belongs to E!1617 EMS project and its main objective is to monitor the noxious emissions in industrial burning processes, offering on-line information about the main interest parameters, which are the GHGs effect factors.

The module achieves online visualization of process parameters and also, the interpretation, average calculations and storage for the parameters values, offering information about the entire aspects of involved environmental activities.

SMARTBER: module for burning efficiency monitoring

This module belongs to E11617 EMS project and its main objectives are the analysis and continuously diagnosis of burning quality, for mono and polycarburant generators using fossil fuels.

This module achieves an intercorrelation between the noxious emissions level, the energy leakages and burning efficiency for steam generators, offering information and expertised values for the technological installation operating conditions closed to optimum.

General hardware and software platform

1. HARDWARE

PC system with the following features:

PC Pentium II / 400 MHz, HDD 10Gb, SDRAM 128 MB, FDD 1.44",
CDROM, 8 MB Video card, fax modem 56K, Zip drive, network
card, sound card, EIZO 21" monitor, keyboard, mouse.

PLC equipment

S7 -300 PLC with the following features:

- CP 314
- PS 307
- Analog Input SM 311
- Digital Input SM 321
- Simatic NET, CP 5611
- Simatic S7, Memory Card.
- Simatic S7, backup battery (Li)
- Repeater (up to 12 Mbit / sec.)
- Simatic S7, conn. cable 830-2

Equipment for flue gases measuring and analysis, (4-20 mA) for the following parameters:

O₂ [% vol]; CO [mg/mc]; Nox [ppm], SO₂ [ppm] -Fuji analysers

Dust [% opacity] -Durag equipments

Fuel flows: Natural Gas (Nm³/h) and Heavy Oil (kg/h);

Flue gases temperature [° C]

Steam flow [t / h]

2. SOFTWARE

- PC operating system: : Windows NT 4.0;
- Office tools: MS Office 2000 Small Business or Professional;
- Simatic WinCC 4.02 Runtime / 128 Tags on-line or off-line software applications;
- Simatic Step 7;

GENERAL INFORMATION ABOUT THE SYSTEM

Open system architecture

The system offers the possibility for further completions and modifications.

The system is a modular one, which has the possibility to add new monitoring and control components within the same logical and functional structure.

Operator interface

The written part of the operator interface is in Romanian Language, with the exception of the English words which are classic in Romanian technical literature.

The interface is easy accessible, clear and friendly for the operator.

The navigation within the system is by means of the main menu and submenus, which include all system functions.

From all the menus is easy to access the main menu.

Laws, standards, Decisions in the project field

STAS 2810-89 – Measurement instruments; Terminology; STAS 8333-89- measurement and control instruments for industrial processes. Analog electronic and electric produces. General technical conditions; The law for Environment Protection – LPM 137 / 1995; Decision MAPPM 462 / 1993 for the emission substances; Decision MAPPM 125 / 1996; STAS 12574 / 1987 – referring to the air quality in protected areas; ISO 9001.

International conventions signed by Romania in the project field

Vienna Convention referring to ozone protection / 22.03.1985; Montreal protocol referring to substances which increase the depletion of ozone / 1989; Law 84 / 1993 for the signing of Vienna Convention; Law 8 / 1991 for signing of the Convention over atmospherically transboundary pollution / Geneve / November 1979.

SMARTBER – module for the burning efficiency monitoring / system functions

- specific process data acquisition (fuel flows – heavy oil and natural gas, Co, O₂, flue gases temperature, load of boiler, etc.);
- conversion into engineer units;
- the calculation of other specific process parameters – virtual line for CO₂;
- energy leakages calculation;
- boiler efficiency calculation;
- calculation over equivalent fictive fuel;
- calculation of the characteristic for equivalent fictive fuel;
- Visualisation for boiler operating points;
- Visualisation of boiler operating areas;
- “maintenance instruments” function;
- reports (hourly averages, archive, data logging, error signalling);
- data storage / decisions specific for burning process;

SMARTFAG – module for noxious emission monitoring / system functions

- specific process data acquisition (SO₂, Nox, O₂ paramagnetic, O₂ zirconia, dust, flue gases temperature and pressure, load of boiler);
- achieving of virtual line for CO₂ (using complex burning graphics and thermodynamic equations).
- Conversion into engineer units;
- Calculation of average values for process parameters (minute, hourly, daily, monthly, yearly average values);
- Synoptic diagram is a logical and functional miniaturization for the technological process and offers a great number of information over the informatic system and monitored process (regarding the noxious emissions);
- Graphical visualisation for the instantaneous values for the monitored parameters and histograms for hourly and daily values for the same parameters;
- Balance sheet calculation;
- Visualisation of the list of events and alarms;
- Reports (daily, monthly, yearly reports; Archive);
- Data storage;