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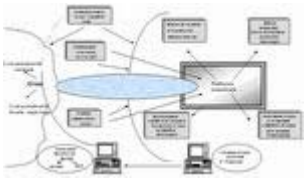
SCADA System for monitoring the environmental parameters under industrial risk conditions

This Project is un integrated system for monitoring and detection of noxis, a prognosis and an assisted decision with a complete information of the decision factors regarding industrial risk and meteorological conditions in chemical plants.

The system achievement is that it informs the decision factors in territory about what decisions shall be carried-out while an accident may occur. The object is a complete connection between all concepts of technological risk, noxis monitoring, industrial security, chemical alarm plan, avoiding accidents, simulation, assisted decision, prognosis, modelling gasses dispersion in the atmosphere in relief and meteorological conditions.

The effects on human activity on the environment are approaching the point where they will exceed the source and sink capacities of the planet. Exceeding source capacity will result in the degradation of natural resources, so they are no longer able to meet human needs or maintain ecosystems.

Exceeding sink capacity will lead to an inability to absorb waste, particularly hazardous waste, a degradation of the natural environment, a reduction in the health of both humanity and other species.



This has led to the proposal for an environmental impact reduction and monitoring centre. As part of the project a number of methodologies was developed to enable firms to analyse and minimise the negative environmental and other impacts of new products and processes, as well as existing activities, while maintaining quality and performance.

These methodologies will be used either on their own or as part of an integrated design environment. To facilitate this a modular structure will be used. Training of the participant companies in the use of the various methodlogies and modules was an important part of the project.

Presentation:

To evaluate and anticipate the impact of the pollutants in air, water and soil, there are created concentric network in the technological installation, round about the pollution units and close by the impact areas. The technological risk will be minimised in the pollution units, so it can be at a tolerant acceptance level, risk will be avoid and emergencies that may occur will be promptly solved.

The system main target (in the pollution units) is to avoid, to launch the alarm before accidents occur, and to maintain the installations at technological levels that doesn't affect environment factors. The system role (in areas District Council - Civil Protection Inspectorate - Environment Protection Agency) is monitoring the pollution units, the areas that might be affected by the pollution factors for keeping the at a tolerance acceptance level and to minimise their effect.

The main target for what the system is created, and sustaining the human effort (correlated in the monitoring units, in intervention and supervision organisms), in taking the optimum solutions while the chemical alarm may occur, and that can be realise by informing the personnel about the specific measures he must take at his work place.

The system has four 4 components:

- preventive through monitoring the technological process, the environment and the utilities
- Analysis and prognosis if a chemical accident may occur
- A complete information of the decision factors
- Evaluator- fulfilling the conditions of medium nonpollution- for IPM

Factors regarding chemical alarm plan are:

- local dispatcher that determents the cause of the chemical focal (in the unit and powerplant)
- chemical alarm dispatcher that puts in use the chemical alarm plan if an accident that affects not only the unit but also the near-by areas occurs
- Civil Protection Agency in the accident spreads and affects outside unit are

This system is conceived regarding these aspects but also regarding regional aspects; the sub-system-involving prognosis, monitoring, simulation and information consists in:

- to determine, locate the place were the focal is
- to determine the noxis quantity dropped
- to determinate and to present the meteorological parameters
- to determine the cloud shape and his evolution using a mathematical algorithm
- to present the evolution on the region map
- to inform in a real time the decision factors in the unit, powerplant and in the region

In a chemical alarm plan you must take in consideration the place where the focal is and also the quantity of noxix dropped so that you can have a specific scenario. The chemical focal, the shape, dispersion and cloud evolution have on their basis the exact location of the place where accident occurred and also the noxis quantity dropped in the atmosphere.

The system offers, in an operative guide regime (offers a maximum of information's to allow the human factor to take the optimum decision), all the information's needed to choose the right scenario, every type of scenario being finalised in an adequate plan.

In implemented this project work there are some basic stages that allow the adaptability and personality of the system for each application:

- to characterise the industrial object through out the protection terms and maximum level of tolerance accepted for noxious emission that has impact over air, water, soil and humans
- to analyse the position of the populated regions from the industrial objective, and also to analyse medium and geographic conditions
- to define the events that can be consider a real danger to the industrial objective: earthquakes, floods but also the phenomenon's that can be caused by the industrial objective to the population
- to complete a full statistic data base with the main events that took place till 10 years ago, their impact
- to establish a graphic chart about the noxious emission especially where the statistic data may create confusion or are inconclusive, or where the specific analysis was not full done; to establish the personnel number and competence, equipment's.
- to define a system for processing data's in order to reach the propose goal, to complete the existing equipment network with what is necessary.

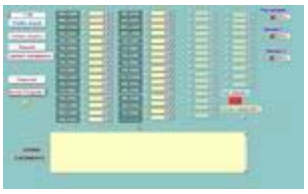
Meteorological module:

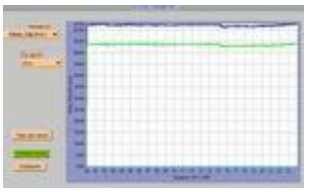
The meteorological module's role is to track down atmospheric conditions in an automatic mode, where noxious emission takes place. If the analysis involves larger areas affected, the meteorological stations are ordered so they can relief wind directions and their characteristics:

- temperature,
- direction,
- speeds,
- solar radiation,
- humidity,
- raining quantities,
- atmospheric pressure.

The main factors involved in the atmospheric dispersion are:

- Severe unstable atmospheric conditions lead to a quick mix and dispersion of the particles in the air, while stable atmospheric conditions prohibit that to happen
- Mechanical turbulence due to the wind, soils, forests and hills
- Existing temperature gradient till 30 meters high in the atmosphere
- The most unfavourable condition is the quiet atmosphere from silent nights and early mornings
- Another unfavourable situation for the dispersion is a not enough higher ceiling





The possible effects of pollution, chemical accident and the impact are being emphasised by a program packet that presents the evolution of the toxic cloud and the dispersion analysis through a map. Through the screen the noxious and gas emission is being presented also with the speed and wind direction and the stability class.

Time studying evolution of the environment concentrations, in a geographical context allows reaching at the results classified in:

- geographical results. We obtain these results from direct information's as: pollution cloud dimensions, affected area parameters- classes of concentrations, regions, districts that are affected
- the impact towards environment, population in particular, by processing a data base that contains information's about the attributes of the affected objects, presenting the number of inhabitants that are affected by lethal concentrations.