Environment Monitoring

Dear Reader,

It is my great pleasure to introduce the activity and product line of the GAMMA Technical Corporation, a significant defence equipment manufacturer company, with the widest defence product portfolio in Hungary. GAMMA was founded in 1920 and with several decades of experience Gamma's products are mainly made for military, civil protection and radiation protection applications.

Our company has always been involved in the R&D of innovative technological solutions, where our intention is to pay special attention to the demand of our Customers. With all our expertise, we are open to support our partners in the planning and realization of any kind of projects in our fields of activity.

Our extensive product range consists of radiation detection and measuring instruments, integrated CBRN/HazMat reconnaissance systems, monitoring and early warning networks, meteorological instruments, as well as reconnaissance and first response vehicles, personal respiratory protective equipment, decontamination systems, special purpose vehicles and trailers. The company has developed the Hungarian "KOMONDOR" Light Armoured Vehicle Family, too.

GAMMA has been producing environment-monitoring systems since 1960. GAMMA offers a wide range of environment monitoring stations, including mobile ones, for monitoring various parameters of the environment such as background radiation, meteorological parameters, and the concentration of dust and harmful gases in the air. Our monitoring stations are capable of storing and forwarding measurement data towards the data center of the local or countrywide monitoring/early warning system they are integrated into. The configuration of the stations is fully customizable according to the customer's needs. The environmental monitoring system product category belongs to our Measuring devices division.

In the followings, we are glad to give you a short summary of our environmental monitoring portfolio what we think and hope to be of interest to you.

Please take the time and download our presentation and the product catalogues of our company using the links on the back of this catalogue. More details about the products can be found at our webpage (www.gammatech.hu).

Should you need any further information please do not hesitate to contact us, we will always be at your service with pleasure.

Yours faithfully,

Attila Zsitnyányi

CEO
GAMMA Technical Corporation

ANNO
1920
GAMMA TECHNICAL CORPORATION
gamma

Purpose of a Monitoring System

- provides information about the actual environmental situation of an area
- sends an automatic warning in case of any changes in environmental parameters
- provides a tool to interact immediately with people affected by environmental change
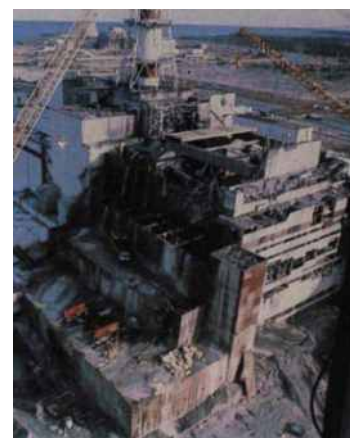
Ambient air quality monitoring

Measurement of main pollutants that people breathe in on the street.

Dangerous plant monitoring

Measurement in the direct proximity of chemical plants to warn people in case of leak.

Radiation early warning systems

Monitoring of background radiation and airborne radioactivity to know the contamination level caused by nuclear activities.

Water quality monitoring

Indicate health risks in natural water and in drinking water sources.

Mobile laboratories

Vehicle based systems to identify chemical hazards in industrial and traffic accidents and to make random tests for non-continuously monitored chemicals.

One of GAMMA Technical Corporation's main activities is manufacturing stationary and mobile monitoring stations and implementing local, as well as nationwide monitoring networks and early-warning systems, including the central data acquisitioning system components.

We customized our systems for disaster management, CBRN defence, environmental protection, radiation protection, air and water quality monitoring, radioactive particle monitoring, emission monitoring, meteorological and agricultural applications.

As our company had the pleasure to implement one of Hungary's largest monitoring networks, a telemetric and public alarm system that is operated by the National Directorate General for Disaster Management, just as several other smaller-scale monitoring systems, we gained vast experience in planning, implementing and maintaining monitoring systems, including the cooperation with the competent authorities during these project phases.

With all our expertise, we are open to support our current and prospective partners in the planning and realization of any kind of monitoring projects from local to countrywide scale.
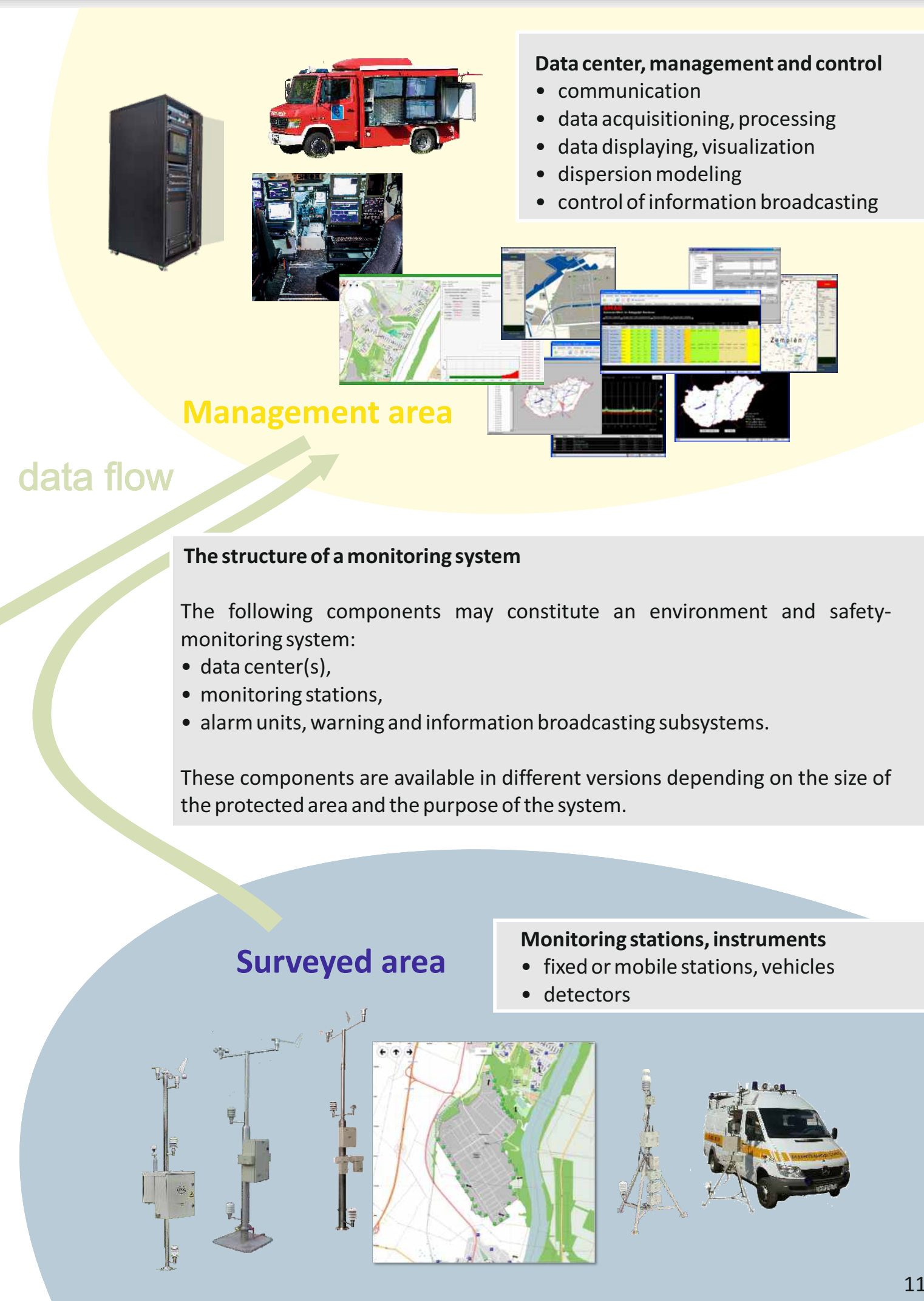
Data center, management and control
- communication
- data acquisitioning, processing
- data displaying, visualization
- dispersion modeling
- control of information broadcasting

Management area

data flow

The structure of a monitoring system

The following components may constitute an environment and safety-monitoring system:
- data center(s),
- monitoring stations,
- alarm units, warning and information broadcasting subsystems.

These components are available in different versions depending on the size of the protected area and the purpose of the system.

Affected area

Information broadcast, warning
- sirens
- local displays
- Web, SMS, email, etc... publication

Surveyed area

Monitoring stations, instruments
- fixed or mobile stations, vehicles
- detectors

The purpose of a monitoring system

- provides information about the environmental conditions of an area
- sends an automatic warning in case of predetermined changes of the environmental parameters
- provides a tool to interact immediately with people affected by the environmental change
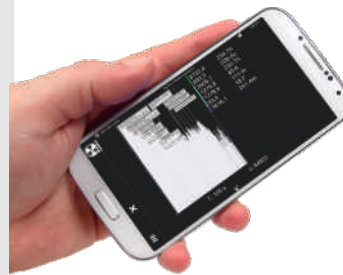
Data center

The data center is the heart of the monitoring systems. It collects all data, errors and alarms from monitoring stations and presents them to the personnel, explaining how the system operates. It helps in decision-making and in giving an interface to inform the right entities and the public of possible danger. In a monitoring system, different versions of data centers can be used; in some cases more data centers can be operated simultaneously.

Communication methods:
- TETRA
- GSM
- Fiber
- P-MP Microwave
- Any IP capable communication media

Data center versions
- Fixed building based systems, main and sub-centers
- Vehicle-based systems
- Portable case-based system
- Mobile phone/tablet application

Single City to Countrywide Monitoring

The most important component of a Monitoring System from the personnel supervisor's point of view is the Control Room Application, providing a simple and intuitive interface integrating all system components while hiding the complexity of the system from its users. The Control Room Application is designed to operate in a single city, factory or in high number of sites around a country, integrated into a single countrywide system.
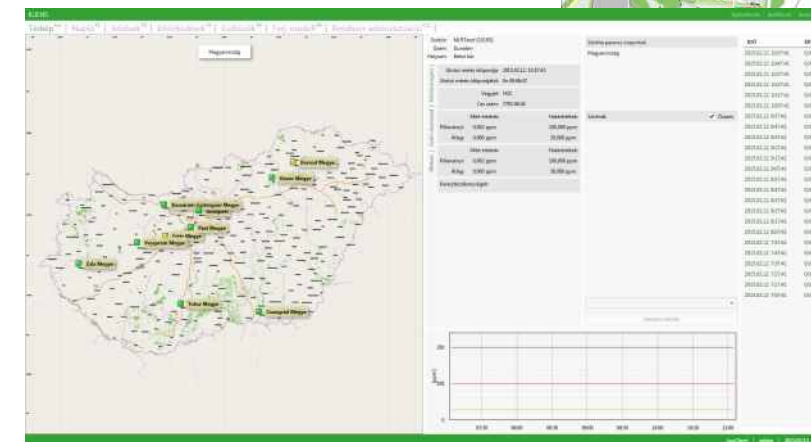
IT Infrastructure scale
- From single computer at single site installations or mobile solutions
- To a complete, distributed data center solution at countrywide installation

The data collection is hierarchised as:
- Client Application
- Central server – connects to the local control servers, collects the data from the whole system and server the client applications
- Local control server – controls the devices in a single district, city or factory
- Device interface software – creates the interface between the local server application and the specific measurement or alarm devices

The system design allows a full-scale installation structured as above, but for smaller installation the whole system can be installed even on a single computer.

Software solution to:

- Collect the measurement information
- Distribute and present the gathered information
- Support the decision making process
- Remote control public alarm systems

Time of last measurement: 2/3/2015 2:59:43 PM
Age of last measurement: 0d 00:01:06

Chemical symbol: H2S
Cas number: 7783.06.04

	Measured values:	Limit values:
Momentary:	83.394 ppm	100.000 ppm
Average:	83.391 ppm	30.000 ppm

	Measured values:	Limit values:
Momentary:	78.380 ppm	100.000 ppm
Average:	78.378 ppm	30.000 ppm

Cross effects:

Presentation

Measurement data is presented in the application in several ways:

- Map icons that are aggregated on high levels – give a very quick overview to see if there is any issue in any monitored area
- Detail sheets for e.g. gas concentrations or meteorology information – give detailed information about the measured data device by device
- Chart and table views – give information about the actual trends of the measured data (e.g. to see whether a gas concentration is still increasing or already decreasing)
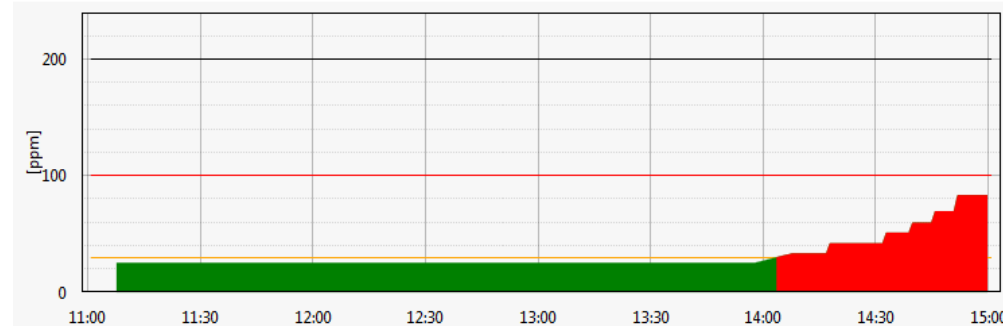
Action Plans

In the case of each alarm situation (e.g. pollution level alarm, gas concentration or radiation level alarm etc.) the application enables action plans that the supervisor personnel should follow as defined. The action plan may contain an address book with the contact information of authorities to notify during the action plan.

After receiving the alarm, the action plan may be started. The supervisor may document the performed action with a single click or by typing in any custom action made. The system automatically logs the time when the action was performed.

If more than one supervisor group (e.g. urban or rural authority) performs their own action plan, they can see the actions of each other, which would simplify communication between them.

Map-based visualization

- Hierarchical map topology – country, region, factory and/or urban
- Aggregated status colouring – e.g. if a regions icon is green it means there is no alarm in the region
- Interpolated air quality visualization overlay
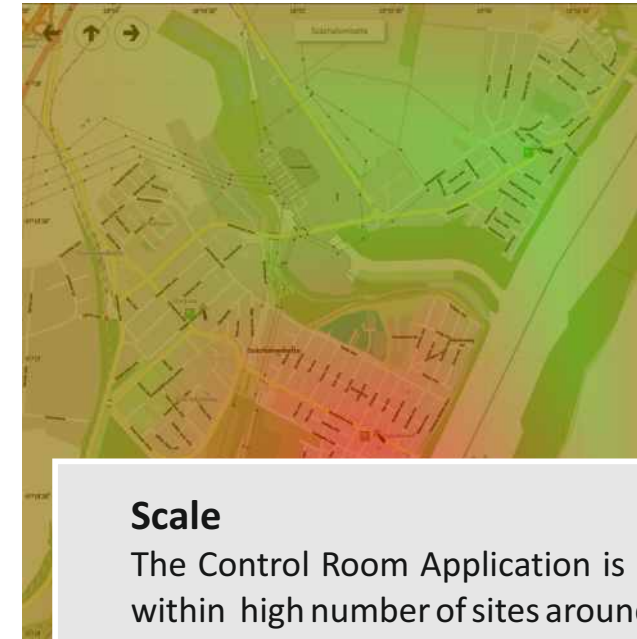
Authorization

In larger-scale installation, it is essential to differentiate between users such as in:

- Access to available maps / devices
- Right to control early-warning system
- Right to manage system configuration

Scale

The Control Room Application is designed to operate within a single city or factory, or within high number of sites around a country integrated to a single countrywide system.

The client application provides an easy geographical view of the sites and the installed measurement devices. The interface shows a very quick colour presentation of the alarm status of the measurement devices so it is easy to get informed about the general status of the supervised sites in seconds. The interface can handle multi-level topologies (e.g. factories, regions, and country).

Having a look at the country-level view, it is still a matter of seconds to see whether there is any alarm in any of the monitored sites in the country.

Selecting individual monitoring devices allows the detailed measurement data of each device to be checked.

Reliability

All parts of the system are designed to allow a full-extent in-depth system monitoring via separate system management tools, from application memory usage to server fans, even to the membrane of the siren pressure chamber.

This high extent of monitoring allows defect repairs before actual outage would occur, resulting in very high system availability.

The system design allows all system components to be implemented redundantly, thereby increasing the reliability even more.

The system management, which is specifically designed to our equipment, can be delivered with the monitoring system customised and configured as a turn-key solution.

Dispersion Modeling

It is inevitable that the possible effects of an accidental gas emission, both during the handling of the emergency and during preparation for such events, must be analyzed. The Dispersion Modeling module of the Control Room Application provides a simple, fast and effective way to estimate the extent of a gas emission and to calculate the affected area and population.

Emission Source

The first step of a dispersion-modelling process is to define the emission source. The most effective way is to pre-define the possible emission sources in the monitored sites. Built emission sources such as containers are easy to document in the system, thus freeing the dispatching personnel from the task of entering source data during the handling of an emergency by simply selecting the given source from the list for the specified site.
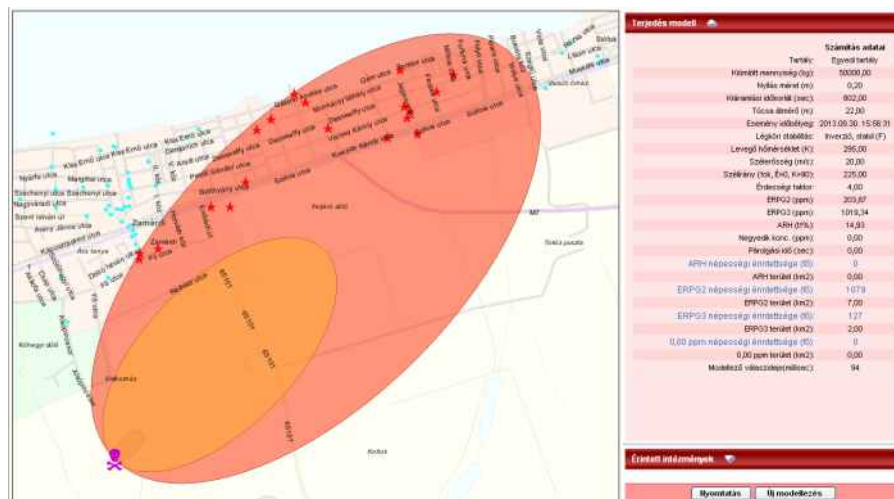
During an emergency, the available information about the emission source usually becomes more and more precise as time passes. The system allows all modeling information, such as quantity, time of the emission, etc. to be overridden at any time.

In case of a mobile or un-predefined source, the first step is to enter all the necessary information of the source, such as the type of gas, the quantities, the location, meteorology etc.

Meteorology

Meteorological information is necessary in order to be able to estimate the direction in which the gas would disperse. The meteorological information may come from one of the following sources:

- The system automatically reads the actual meteorological information from the nearest monitoring device equipped with meteorological sensors – this is the best choice for handling an actual situation
- The user can overwrite the data given by the system – helping the preparation work for future possible situations

Modeling

After setting up the necessary information for the modeling, it is a matter of seconds to receive the results of it:

- A geographical representation of the largest-affected dispersion area for given concentrations that can form based on the entered information.
- The numeric representation of the affected area for each concentration.
- The number of people affected broken down to gender and age groups for each concentration to help in estimating the amount of work, for example, evacuating the affected population.
- The list of all institutions, grouped by categories in the affected area. For example these institutions can be marked as processed to help following notifications about them.

Modeling results

Precise dispersion modeling is a very complicated science, even setting up a proper modeling scene, on the one hand needs professional educated personnel, on the other hand it is a very time-consuming task. However, in case of an emergency gas emission situation there is no time to run long processes of modeling. Our dispersion module makes it possible to

- Run the model without highly educated personnel – with pre-defined emission sources
- Get modeling results in a matter of seconds

The modeling result is not necessarily very precise in trade of speed and availability but always a conservative one.

Environment monitoring stations

The TVS-3 monitoring station measures the different parameters of the environment and sends the measurement data to the central data acquisition unit. TVS-3 is an automatic device that is capable of the continuous and independent monitoring of an area, helping the prompt evaluation of a current situation, and determining the spread of environment polluting materials.

Installed monitoring stations:

- a pre-installed early warning system can provide continuous supervision, and information right from the beginning, allowing immediate intervention, if necessary. It is operational without any human interference.
- functional on country, county and site levels

Mobile monitoring stations:

- portable or vehicle mounted system
- periodical checks
- in case of emergency or on-site verification of suspicion
- simple usage without external power source
- sample collection for future laboratory measurements

Typical measured parameters:

- criteria pollutants: CO, NO_x, SO2, O_3, VOC
- particles: TSP, PM10, PM2.5, PM1
- toxic industrial gases: NH_3, H_2S, HF, Cl_2,...
- flammable gases: LEL
- CWA
- meteorological parameters
- gamma dose rate
- alpha, beta airborne particle concentration

Typical configurations

Type	Measures	Installation	Features
TVS-3 AQM	CO, NO_x , SO_2, O_3, VOC, PM10, PM2.5, temperature, pressure, humidity, wind	fixed	data collector
TVS-3 MLR	TIC gases, temperature, humidity, wind,	fixed	redundant gas sensors, data collector
TVS-3 RB	TIC gases, temperature, humidity, wind,	fixed	ATEX certified, data collector
TVS-3 M	temperature , humidity, wind, gamma dose rate , TIC gases	mobile	data collector
TVS-3 MLU AM6	temperature , humidity, wind, gamma dose rate , TIC gases	mobile	no moving parts, data collector
OnRIM	airborne radioactivity, isotope selective activity concentration (α, ß, γ)	fixed / mobile	automatic changing of filter cartridges

Measuring techniques:
- standard method (analyser)
- informative measurements (measuring cells)
  - according to the gases to be measured
    - selective sensors (electrochemistry, IR)
    - detectors, which operate in a wide spectrum (IMS, flame photometry)
  - according to the method of measurement
    - point type
    - distance reconnaissance
    - built-in emission measurement in the emission point (chimney)

Measured parameters	Principles	Measuring range
CO	electrochemical	0.01 … 50 ppm
NO	electrochemical	0.02 … 5 ppm
NO2	electrochemical	0.005 … 5 ppm
SO2	electrochemical	0.005 … 5 ppm
O3	electrochemical	0.005 … 5 ppm
VOC	PID	0.01 … 20 ppm
PM10, PM2.5, PM1, TSP	laser light-scatter	0.001 … 100 mg/m3
Temperature	thermocouple	-40 … +60 -C
Humidity	capacitive	0 … 99 RH
Wind	mechanical or ultrasonic	Direction: 0 … 360- velocity: 0,4 … 60 m/s
Barometric pressure	piezoresistive	750 … 1150 hPa
Gamma dose rate	GM tube	30 nSv/h … 10 Sv/h
Airborne radioactivity	scintillation detector	**MDC (t= 30 min):** I-131: ≤ 10 Bq/m^3 Cs-137: ≤ 10 Bq/m^3 Co-60: ≤ 10 Bq/m^3 Gross α: ≤ 1 Bq/m^3 Gross ß: ≤ 2 Bq/m^3 Gross γ: ≤ 6 Bq/m^3

Meteorology:
- temperature, humidity, air pressure
- for spread calculation, defining fall-outs

Detectors

Air quality (gas detection)
- high concentration (NH_3, LEL, HF…)
  - observation of dangerous gases leaving the area of facilities that process and/or store hazardous materials
  - surveillance of the emission of industrial plants
- low concentration (NO, NO_2, SO_2, CO…)
  - it helps to define the amount and concentration of pollutants in residential areas

Examples of detected gases:
- flammable gases like methane, propane, solvent vapors
- carbon monoxide (steel plants)
- chlorine, phosgene (pesticide plants)
- dimethyl amine, acrylonitrile (plants for acryl and amine based plastics)
- hydrogen sulfide, hydrogen fluoride (oil refineries)
- ammonia, nitrogen oxide (pharmaceutical plants, fertilizer factories)

Particle pollution:
- measurement of TSP, PM10, PM2.5 and PM1

Monitoring of radioactivity in the environment:
- Gamma background radiation. Monitoring surrounding nuclear activities (nuclear experiments, nuclear plants)
- The concentration of alpha, beta, gamma radiation in air (hospitals, radioisotope producing labs, etc.)
- Noble gas, alpha, beta, gamma radiation emission (nuclear facilities, emission of hot cells)

Other…
Almost any other kinds of detectors can be integrated on customers' demand

The real purpose of monitoring dangerous activities or environment parameters, and detecting any dangerous situation is to protect the people living or working in the affected areas, therefore it is essential to equip the monitoring system with an integrated early-warning solution and possibly several different information broadcasting solutions to inform the public.

Ways to inform
- Web publication
- Information exchange with national or international authorities
- Early warning systems
  - Sirens
  - In-door alarm interfaces
- Local displays
- Radio / Television
- SMS, text messages
- E-mail

Sirens
One of the most widely used early-warning technologies is a public alarm system formed by **electronic sirens,** installed in endangered areas (e.g. the settlements around a factory or along the seaside, or even within the factories themselves).

Electronic power	Sound pressure
300W	103dBa / 30m
600W	109dBa / 30m
900W	112dBa / 30m
1200W	115dBa / 30m
1500W	118dBa / 30m

Notifications	
Pre-defined signals	Programmable dual-tone signal generation
Pre-defined speech stored in the siren	Up to 9 speech notifications
	Up to 15 minutes of stored speech
Pre-defined speech stored in the Control Room Application	Almost unlimited number of notifications
	Up to 4 minutes length per notification
Live speech	Transmitted from the workstation microphone

Installation forms
Stand-alone pole
Flat roof
Individual design (e.g. tent roof)

Operation modes
One by one
In pre-defined groups
Custom groups created by the operator

Siren locations
The location of the sirens has to be carefully designed to ensure that the largest area is covered so that people would hear the notifications, while keeping the number of necessary siren stations at the minimum to save budget.
Our experts have unique knowledge and experiences in acoustically-designed public alarm systems in industrial areas and settlements from small villages to cities.

Indoor alarm interface
While sirens can alarm the population outdoors, a large number of people would be in buildings, like shopping centers, schools etc. Our **Indoor Alarm Interface** can reach those people too.

- Provides the same functionality as the early warning sirens
- Uses the existing sound systems of the buildings
- Cost effectively solves the task of warning people inside public facilities

Local displays
The data collected by the monitoring stations can be displayed publicly to inform the public

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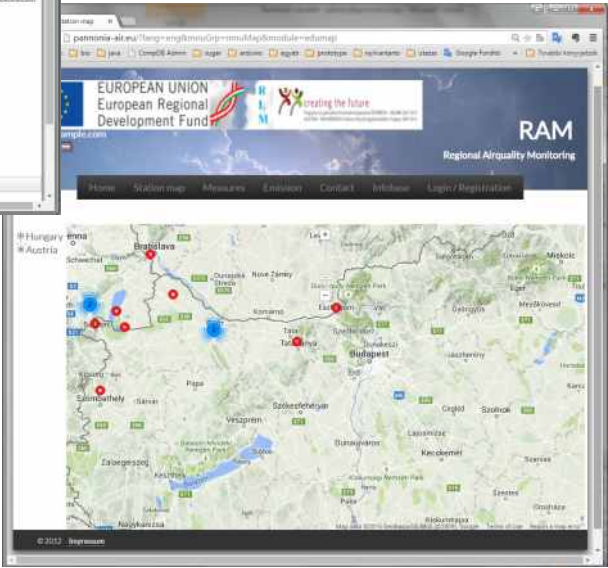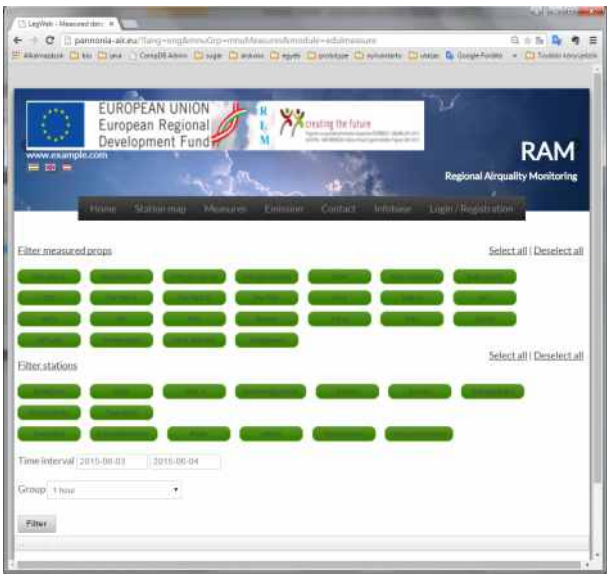
Dangerous factory monitoring

Countrywide telemetric and Public Alarm System

As an accompanying effect of the economic growth, factories and other industrial facilities that produce, use or store dangerous substances constitute a high risk factor to the natural environment and to those living in the vicinity.

Reference 1: Countrywide telemetric and public alarm system, realized and maintained by MLRTech Ltd., is implemented in the 19 most dangerous industrial plants of Hungary, selected through risk analysis, and in 30 settlements around them. The system consists of more than 300 monitoring stations and more than 500 public alarm sirens.
All the systems are integrated into a single Control Room Application monitored by disaster management specialists in 10 disaster management monitoring centres. GAMMA provided numerous parts of the system including the data acquisition software products and all the monitoring stations.

Regional telemetric and Public Alarm System

One region or district can set up their own monitoring system, focusing on threats occurring in the area.

Local telemetric and Public Alarm System

Industrial plants and institutions may build up a monitoring system to monitor their activity and to give an accurate report to authorities about possible contaminations affecting the surroundings.

Reference 2: Telemetric and public alarm system implemented in an LPG bottling and storage plant.
The factory installed 7 monitoring stations in the plant area and 5 public alarm sirens in the affected area of the neighboring town.

Radiation monitoring

Countrywide system against external effects

Automatic Measurement and Data Acquisition System for gamma background radiation monitoring

Reference 3: Monitoring stations in every major city.
Redundant data centers.
Part of the European Radiological Data Exchange Platform.
Detectors:
- Redundant dose rate transmitters
- Rain status sensor
- Wind, humidity and temperature sensors

Reference 4: Measuring stations at military bases. Mobile stations are used for missions abroad.
Fixed and mobile data center.
Measured parameters:
- Gamma radiation
- Wind at 3 m or at 10 m height
- Rain status
- TIC, CWA gas concentration
- Air pressure, humidity, temperature

Local systems for monitoring isotope labs and nuclear facilities

Reference 5: Radiation protection system of research and educational nuclear reactor and isotope production institutes
- Area monitoring
- Portal monitoring
- Emission monitoring
- Dosimetry system

OnRIM Online Radioactive Aerosol and Iodine Monitoring Station

The OnRIM Online Radioactive Aerosol and Iodine Monitoring Station is a highly sensitive device intended for measuring, and creating reports and analysis about the environmental effects of radioactive releases in the surroundings of nuclear facilities, such as nuclear power plants, radiopharmaceutical and industrial isotope production companies, C-level isotope laboratories, as well as in case of nuclear accidents.

- Monitoring airborne radioactivity in the proximity of nuclear facilities, isotope laboratories
- Simultaneous alpha, beta, gamma measurement with spectrum stabilization
- Isotope selective activity concentration
- Automatic changing of filter cartridges
- Connectivity with data acquisition units, monitoring networks
- Autonomous operation with low maintenance requirements
- Outdoor operation - IP66 protection, wide operational temperature range
- The operation is not affected by the temperature, or dust content of the inlet air

Options:
- pre-heating
- dehumidifier
- cyclon for dust extraction
- sampling unit for emission monitoring
- local audible and visual alarm
- display

OnRIMview

	Co-60	I-131	Cs-137	alpha	beta	gamma
5 minutes concentration Time cover: 100% 15-02-2021 05:20:00	< 137,2 Bq/m3 MDC 137,2 Bq/m3	< 93,2 Bq/m3 MDC 93,2 Bq/m3	< 90,0 Bq/m3 MDC 90,0 Bq/m3	< 396,9 mBq/m3 MDC 396,9 mBq/m3	< 281,0 mBq/m3 MDC 281,0 mBq/m3	< 138,9 Bq/m3 MDC 138,9 Bq/m3
30 minutes concentration Time cover: 100% 15-02-2021 05:00:00	< 9,5 Bq/m3 MDC 9,5 Bq/m3	< 6,4 Bq/m3 MDC 6,4 Bq/m3	< 6,1 Bq/m3 MDC 6,1 Bq/m3	< 13,9 mBq/m3 MDC 13,9 mBq/m3	< 17,7 mBq/m3 MDC 17,7 mBq/m3	< 9,5 Bq/m3 MDC 9,5 Bq/m3
6 hours concentration Time cover: 95.83 15-02-2021 12:00:00	< 237,8 mBq/m3 MDC 237,8 mBq/m3	< 158,3 mBq/m3 MDC 158,3 mBq/m3	< 152,0 mBq/m3 MDC 152,0 mBq/m3	< 404,4 uBq/m3 MDC 404,4 uBq/m3	< 280,6 uBq/m3 MDC 280,6 uBq/m3	< 242,9 mBq/m3 MDC 242,9 mBq/m3
24 hours concentration Time cover: 59.03 15-02-2021 12:00:00	< 60,4 mBq/m3 MDC 60,4 mBq/m3	< 41,3 mBq/m3 MDC 41,3 mBq/m3	< 39,3 mBq/m3 MDC 39,3 mBq/m3	< 13,7 uBq/m3 MDC 13,7 uBq/m3	< 9,7 uBq/m3 MDC 9,7 uBq/m3	49,1 mBq/m3 MDC 4,8 mBq/m3

Air flow   - m3/h | Clear filters   -   Cps: 216
NDI Connection: Disconnected | Measurement   Serial number   0

Air Quality Monitoring System (AQMS):

The basic elements of an AQMS are automated measurement stations. They measure and collect the data without daily human intervention.

AQMS collects the necessary knowledge for decision makers
- To know the sources and level of pollution
- To plan what to do, based on the information
- To warn people about high pollution levels

Generally two main type of measuring stations can be considered:
- Large size laboratory containers with advanced instrumentation (container station)
- Small size wall or stand-mounted boxes with simplified equipment (standard station)

Standard stations

These stations represent an economical solution, using non- reference measuring methods. They are good supplements for container stations in relatively polluted areas, or at measuring points with limited space (cities, main roads).
Electrochemical, semiconductor or photo-ionisation sensors are used.
Less space is required for installation compared to container stations, thus providing a wide range of application possibilities.

Water quality monitoring

The online water quality monitoring system is capable of indicating the changes in water quality (parameters) and performing a variety of measurements in water, on site.
The monitoring system has an instrumentation with a wide measuring range to perform successful measurements and sampling either in clean or in heavily polluted water.

Build Your own customised Air Quality Monitoring System, prevent serious damages and inform the public with our help!

Download our catalogs and company presentation via the following links

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