Catalyst Applications

The Definitive Solution for Catalytic Processes & Research

CatalySys

From ESS Ltd

CatalySys from ESS represents the ultimate in Mass Spectrometry and vacuum technology.

Designed specifically for Catalyst monitoring applications, CatalySys offers the highest standards of performance and ease-of-use. Housed within a compact space saving cabinet, the unit can be positioned in very close proximity to the reactor / plant.

Control is by means of a LAN connection, allowing operation via the supplied PC or remotely via a network.

CatalySys features full safety interlocks ensuring that damage due to inadvertent operation is avoided.

Features of CatalySys systems include:

- **Twin Capillary inlet (standard inlet length is 2m) arrangement, meaning that the user can monitor both sides of the Catalyst thus enabling efficiency to be calculated directly**
- **Full integration into PLC / control systems, allowing automatic control of gas feeds**
- **Automatic switchover of inlets, with user definable sample times on each line**
- **Data storage in individual files for each inlet, time and date stamped**
- **Automated operation possible**
- **Ultra-fast response time of 150mS, ensuring that all process events and catalyst breakthroughs are captured**
- **Real time monitoring of up to 64 gas species**
- **Direct injection of gases directly into the ion source**
- **Fully Quantitative analysis (with calibration gas)**
- **Extremely low detection levels**
- **Remote stop / start function**
- **Corrosive gases option**
- **Full process plant integration**

ESS Ltd
GeneSys House | Denton Drive | Northwich | Cheshire | CW9 7LU UK
Tel: +44 (0)1606 49400 | Fax: +44 (0)1606 330937
Email: sales@essco.com
Web: www.essco.com

CatalySys

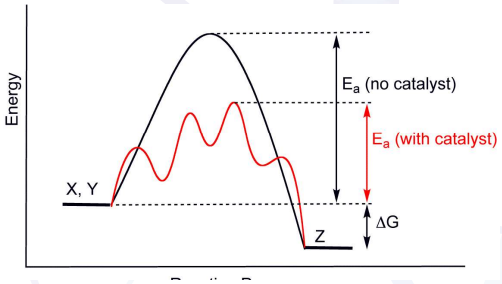
All CatalySys systems feature a 200 amu (300 optional) precision Mass Spectrometer with ultra gas tight ion source in a high throughput all metal analyser housing.

High vacuum is provided by means of an 80 l/s turbomolecular pump backed by a dry diaphragm pump and all-metal construction of the vacuum system ensures the utmost vacuum integrity and ultra low background levels.

Operation and Control

CatalySys instruments can be linked to Catalyst reactors to provide two types of control, these being:-

- **Direct feedback, monitoring and control of the Gas phase composition**
- **Calibrated continuous record of the entire Gas phase**



Normally, CatalySys is connected to the reactor by means of the capillary inlets to the reactor port with a small bleed flow of gas (around 50 ml/min) supplied to atmosphere, past a T-piece containing the capillary inlet, and the instrument set up to run the reactor gases with time, with the software configured to record the data either as a percentage of the bulk gas or as individual intensities / concentrations. Outputs can be directly fed to the process control system to control the gas feeds into the reactor.

The result is that the gas phase composition of the Catalyst can be very closely controlled, thus helping to maximise the yield. If the second capillary inlet is positioned at the reactor outlet, it allows the user to calculate the catalyst efficiency, and permanent optimisation of the catalyst is achieved.

With CatalySys the user is in full control of the entire process at all times.

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GeneSys House | Denton Drive | Northwich | Cheshire | CW9 7LU UK
Tel: +44 (0)1606 49400 | Fax: +44 (0)1606 330937
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Catalyst Applications

The Definitive Solution for Catalytic Processes & Research

EcoCat-P

From ESS Ltd

EcoCat-P from ESS sets the benchmark in real-time monitoring of Catalyst process and research applications. Specifically designed for Catalyst applications, this system benefits from years of research and listening to customer requirements.

EcoCat-P offers the ultimate in performance within a compact, portable package, allowing the system to be positioned next to the reactor, while the flexibility of Ethernet connection gives the user the ability to operate the system over a local area connection (LAN) or wirelessly.

Due to the ultra-fast response time, combined with low detection levels, the complete process is measured, ensuring that no events are missed, offering a significant improvement over other techniques as improved control can be immediately implemented, thus maximising Catalyst efficiency and improving yield.

EcoCat-P instruments can provide two types of analysis and control, these are direct feedback monitoring and control of Gas Phase Composition or a calibrated continuous record of the entire gas phase.

Supplied with two inlets as standard, both the inlet and outlet of the reactor can be monitored, ensuring that maximum efficiency is achieved, obviating slow GC analysis with manual control.

Equipped with a very high sensitivity dual detector Quadrupole Mass Spectrometer (QMS), EcoCat-P offers a broad dynamic range, with detection capability from low ppb / ppm right up to high percentage levels.

With full software control of the vacuum system, all operating parameters can be adjusted directly from the PC.

ESS Ltd
GeneSys House | Denton Drive | Northwich | Cheshire | CW9 7LU UK
Tel: +44 (0)1606 49400 | Fax: +44 (0)1606 330937
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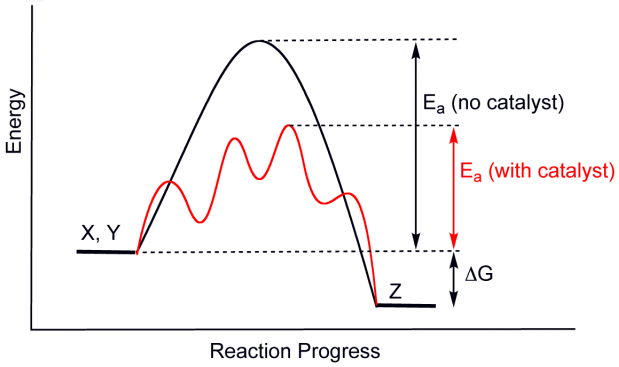
Web: www.essco.com

EcoCat-P

This system has been designed specifically for Catalyst applications, and users benefit from:

- Two Inlets as standard with automated switch over - both inlet and outlet from the reactor can be monitored, giving better control of the process
- User defined sampling time on each inlet - allowing full flexibility in process control
- Individual data storage files for each inlet - date and stamped data on each inlet gives excellent QA records
- Simultaneous monitoring of Catalyst temperature
- Ability to send data 'live' into other programs - data can be immediately exported into other formats e.g. Excel
- Fast response time - with a response time of 120mS, true real time monitoring of the process is achieved
- Oil free vacuum system - Hydrocarbon free system ensures no interferences, with minimal maintenance required
- Data stored in individual files for each inlet
- Automated, unattended operation
- Full plant interfacing option



ESS Ltd
GeneSys House | Denton Drive | Northwich | Cheshire | CW9 7LU UK
Tel: +44 (0)1606 49400 | Fax: +44 (0)1606 330937
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Pharmaceutical Applications

Process Optimisation for Pharmaceutical Processes

PharmaSys

From ESS Ltd

The PharmaSys system by ESS have been designed specifically for fast, online monitoring of solvent vapours, other gas species, and additional process parameters in pharmaceutical applications.

These systems offer unparalleled performance in terms of sensitivity, speed, flexibility and ease of use, and feature an optional fully ATEX rated (weatherproof) enclosure for use in hazardous areas, meaning that the instrument can be positioned in the hazardous area itself.

With the capability to monitor multiple components (up to 64) in real time and quantitative results, and a response time of just 0.2s together with automatic calibration routines, PharmaSys gives you direct control of your drying process, increasing efficiency by up to 60% when compared to halting the process to perform manual loss of drying (LOD) tests. Other parameters, such as temperature, can also be read by PharmaSys, enabling drying status to be monitored alongside temperature.

PharmaSys is supplied with 10 sample inlets as standard, allowing for multiple drying stations to be monitored from a single system. There is also the inbuilt flexibility insofar as different sample mixtures can be analysed on different inlet streams, expanding the capabilities to monitor several different process types at once. (Inlets can be expanded in banks of 10)

All sample points are continuously pumped, ensuring that 'fresh' sample arrives at the Mass Spectrometer when that sample stream is selected. The measurement time on individual sample points is user selectable, and can be measured in any desired order. With full, automated unattended operation and integration into the plant control system, together with automated report generation, these systems a suited to many Hazardous area monitoring applications, including:

- **Solvent drying**
- **Freeze Drying**
- **Gas scrubber systems**
- **BTX and VOC applications**

With a high sensitivity, membrane inlet giving a wide dynamic range from low ppb to percent levels, PharmaSys is the system of choice for accurate on line process control of VOC and solvent monitoring applications. The quality of the data means that it can be used in six-sigma modelling in generating process quality improvements.

ESS Ltd
GeneSys House | Denton Drive | Northwich | Cheshire | CW9 7LU UK
Tel: +44 (0)1606 49400 | Fax: +44 (0)1606 330937
Email: sales@essco.com
Web: www.essco.com

PharmaSys

A very high sensitivity Quadrupole analyser, equipped with an enhanced gas tight enclosed ion source, PharmSys offers a broad dynamic range with detection capability from low ppb levels tight through to high percentage levels. With a response time of just 0.2 s, PharmaSys offers the following features in order to ensure full workplace compliance monitoring:

- **Fast Response - 0.2s response time gives true real time monitoring**
- **User selectable sample times**
- **Full report generation suite, including full statistical analysis. Time and Date stamped reports**
- **Data Storage in individual files for each sample point**
- **Ultra low level detection**
- **Automated report generation and printout**
- **Designed for solvent process applications**
- **Wireless operation option**
- **LAN Interfacing- instrument can be monitored / operated from outside hazardous area**
- **Up to 64 Sample points (in banks of 10) all continuously pumped**
- **ATEX rated**
- **Automated calibration ensures integrity of results**
- **Ability to activate / deactivate sample points as required (e.g. switch off when areas of process are not active**

PharmaSys systems are based upon ESS field proven technology, with its unparalleled reliability record.

ESS Ltd
GeneSys House | Denton Drive | Northwich | Cheshire | CW9 7LU UK
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SemiConductor Applications

Low Footprint, High Precision Mass Spectrometer System

ReacTorr-S

From ESS Ltd

The ReacTorr-S from ESS represents the very latest in technology for a range of Semiconductor Process monitoring applications, including:

- **Vacuum Monitoring**
- **CVD**
- **Baseline RGA**
- **Outgassing of Wafer**
- **Ion Implant**
- **Etch**
- **Transfer Chamber monitoring**
- **Pump-down profile monitoring**
- **Leak Testing**
- **Process Gas Purity**

ReacTorr-S is unique in that it offers true monitoring throughout the entire process stage. A special automated inlet valve is regulated by means of direct feedback control; the inlet valve adjusts automatically irrespective of the process pressure, maintaining a constant pressure in the Mass Spectrometer system at all times. With its very small footprint, ReacTorr-S is a highly cost effective solution in clean rooms.

At the heart of the instrument is a very sensitive Quadrupole Mass Spectrometer, which is equipped with an enhanced enclosed ion source, giving ppb detection levels coupled with superb stability and fast response time. The design of the system is further underpinned by ESS legendary reliability.

The compact design means that the system can be mounted directly onto the process tool so true monitoring conditions are met, and a powerful, easy to use software suite operates and controls the system. The software package has been specifically designed for process tool applications, and allows the user individually selectable operating modes for a particular process application. ReacTorr-S will save time and money and significantly enhance the integrity of your process application.

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Tel: +44 (0)1606 49400 | Fax: +44 (0)1606 330937
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ReacTorr-S

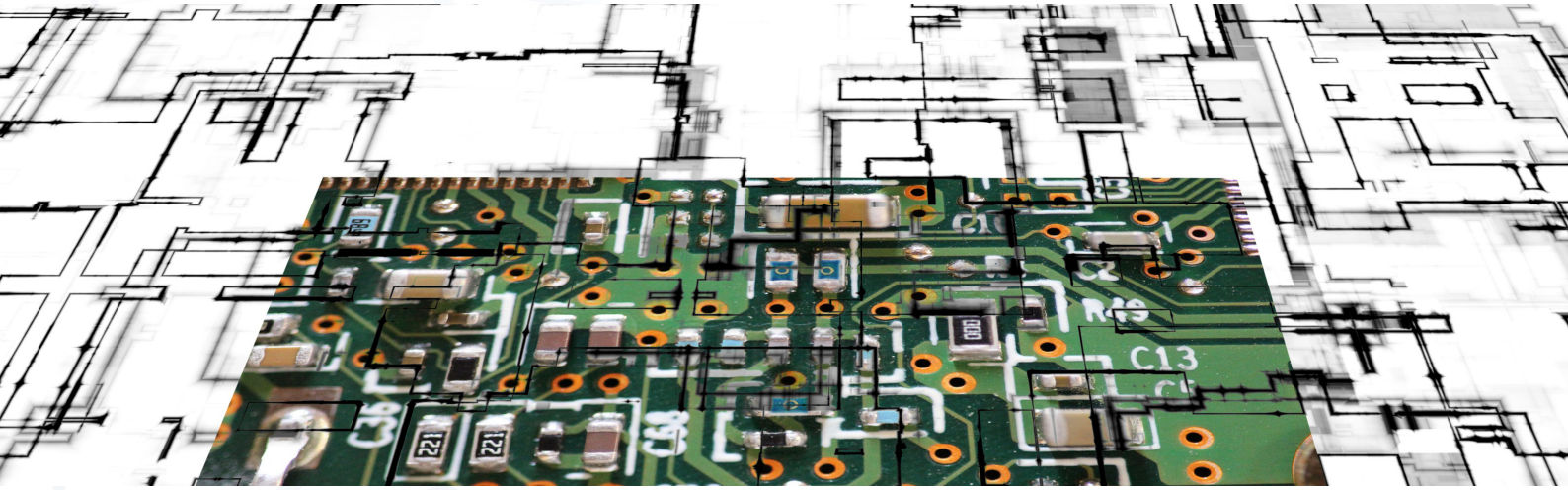
Some of the capabilities are highlighted here:

Real Leaks - by tracking the ratio of N2 to O2 during the pump-down phase, it is quick to establish if a leak is real or virtual. In the event of a real leak, the system will alert the operator to enter a dedicated leak detect mode to locate the source of the leak.

Material Outgassing - establish better quality control by monitoring outgassing characteristics and creating a 'profile' for that process tool.

- **Bakeout outgassing profiling**
- **Statistical Process Control**
- **Yield Improvement**

ReacTorr-S can be used on single chamber installation and cluster tools alike. Full control of the vacuum system is from the control PC, which connects to the analyser electronics by means of an Ethernet cable (wireless operation optional), and the simple to use software allows for operation from simple baseline RGA studies up to full statistical process control.



ESS Ltd
GeneSys House | Denton Drive | Northwich | Cheshire | CW9 7LU UK
Tel: +44 (0)1606 49400 | Fax: +44 (0)1606 330937
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Vacuum Process

Compact Mass Spectrometer System for Vacuum Process Monitoring

ReacTorr-V

From ESS Ltd

The ReacTorr-V from ESS represents the very latest in technology for a range of Vacuum Process monitoring applications, including:

- **Sputter Coating**
- **Solar Panel research/ manufacture**
- **Freeze Drying**
- **Glass Coating / Special treatments**
- **Vacuum Coating**
- **Baseline RGA monitoring**
- **Curing**

ReacTorr-V is unique in that it offers true monitoring throughout the entire process stage. A special automated inlet valve is regulated by means of direct feedback control; the inlet valve adjusts automatically irrespective of the process pressure, maintaining a constant pressure in the Mass Spectrometer system at all times. With its very small footprint, ReacTorr-V is a highly effective solution as it can be positioned directly adjacent to the vacuum process with minimal length connection line, meaning that true process parameters are measured.

At the heart of the instrument is a highly sensitive Quadrupole Mass Spectrometer, which is equipped with an enhanced enclosed ion source, giving ppb detection levels coupled with superb stability and fast response time. The design of the system is further underpinned by ESS legendary reliability.

The compact design means that the system can be mounted directly onto the vacuum tool so true monitoring conditions are met, and a powerful, easy to use software suite operates and controls the system. The software package has been specifically designed for vacuum process applications, and allows the user individually selectable operating modes for a particular process application.

ESS Ltd
GeneSys House | Denton Drive | Northwich | Cheshire | CW9 7LU UK
Tel: +44 (0)1606 49400 | Fax: +44 (0)1606 330937
Email: sales@essco.com
Web: www.essco.com

ReacTorr-V

Some of the capabilities are highlighted here:

- **Real leaks - By tracking the ratio of N2 to O2 during the pump-down phase, it is quick to establish if a leak is real or virtual. In the event of a real leak, the system will alert the operator to enter a dedicated leak detect mode to locate the source of the leak**
- **Material outgassing - Establish better quality control by monitoring outgassing characteristics and creating a 'profile'**
- **Bakeout outgassing**
- **Statistical Process Control**
- **Yield Improvement**
- **VOC monitoring and control**
- **Baseline Monitoring**
- **Materials outgassing**
- **Rack Mount Option**

ReacTorr-V provides in-situ monitoring of all process parameters, and the compact field proven electronics connects via a LAN Ethernet cable to the control PC, preloaded with simple, recipe driven easy to use software, allowing for operation of simple RGA baseline studies to complex statistical process control capabilities.

A lower budget instrument with manually operated inlet is also available.

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Tel: +44 (0)1606 49400 | Fax: +44 (0)1606 330937
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Ultratrace-PPT

Ultra high sensitivity, Maximum Performance Mass Spectrometer

Ultratrace-PPT

From ESS Ltd

UltraTrace-PPT from ESS is the flagship instrument of our product range and gives a level of sensitivity and accuracy that is unbeatable and unparalleled. Designed specifically for ultra low level detection of organic components, UltraTrace-PPT offers the user True parts per trillion level detection.

ESS uses a linked hybrid technique which combines the class leading EcoSys-P Mass Spectrometer with a Thermal Desorber. This method allows for rapid pre-concentration of sample gas with subsequent injection into the Mass Spectrometer, allowing organic compounds (e.g. Benzene, Toluene, etc.) to be detected at levels as low as **100 ppt (parts per trillion).**

For ultimate flexibility, the EcoSys-P can be easily removed from the system for operation as a stand-alone mass spectrometer if required.

Typical Application Areas:

- **Ambient Air VOC's**
- **Fugitive Emissions monitoring**
- **Contamination Detection in Food Grade / Medical Grade Gases**
- **Personnel Exposure risk monitoring**

Gas entering the Thermal Desorber is stored on a cooled tube containing an adsorbent material. The volume stored is carefully controlled by Mass-Flow controllers. Sample to the MS is 'stepped' depending upon stored volume. Hence the greater stored volume, the lower the detection limits. Typically storing for 2 minutes gives c. 100 ppt volatile detection.

Sample gas is transmitted from the TD to the MS via the high sensitivity membrane inlet of the EcoSys-P. This, in turn, passes directly into the ultra-gas tight ion source, where ionisation takes place. Thereafter sample gas is speciated by the quadrupole mass filter.

For non-organic species, these can be analysed directly by the mass spectrometer using a bypass arrangement for direct transfer into the EcoSys-P.

For applications that do not require these extreme detection capabilities, the EcoSys-P can be used as a stand-alone MS, or easily removed to give the flexibility of a portable option.

ESS Ltd
GeneSys House | Denton Drive | Northwich | Cheshire | CW9 7LU UK
Tel: +44 (0)1606 49400 | Fax: +44 (0)1606 330937
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Ultratrace-PPT

Apart from having a cryogen-free thermal desorption system, Ultratrace-PPT offers several other advantages, such as:

- **Wireless remote operation option**
- **Multiple Point Sampling- fully user adjustable - Up to 64 Sample points**
- **Unique data file for each sample point**
- **Automatic calibration option**
- **Long Distance sampling**
- **Unattended operation**
- **Removable EcoSys-P Mass Spectrometer**

Notable users include the Government of Singapore EPA (Jurong Island), Budweiser, Guinness, Queensland EPA (Australia).

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Tel: +44 (0)1606 49400 | Fax: +44 (0)1606 330937
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Pure Gas, Gas Mixtures & Food Grade Gases

Full analytical monitoring and control of trace impurities in gases

GasTrace

From ESS Ltd

GasTrace from ESS represents the very latest in Mass Spectrometry and vacuum technology.

Designed specifically for Pure Gas and Gas Mixture monitoring applications, GasTrace offers the ultimate in performance and ease-of-use. Housed within a compact space saving cabinet, the unit can be positioned in very close proximity to the reactor / plant.

With its ability to monitor different species from several gas streams, GasTrace is a highly cost effective solution, with one system able to replace several discrete analysers.

Construction is by components of extremely high quality, and coupled with ESS legendary reliability record, the user is assured of very low cost ownership and minimal maintenance requirements.

Control is by means of a LAN connection, allowing control via the supplied PC or remotely via a network.

GasTrace features full safety interlocks ensuring that damage due to inadvertent operation is avoided.

These systems are ideally suited for the following application areas:

- **Trace impurity measurement in pure gases and mixtures**
- **Diving Gases**
- **Analysis of Gas Feedstock into production lines**
- **Air Separation Unit monitoring and control**
- **Gas Ratios on cylinder feedstock**
- **Gas Scrubber / Purification plants (e.g. Charcoal filtration on CO2 plants etc.)**
- **Impurity monitoring in Semiconductor plants**
- **Cylinder fill monitoring (QA control)**

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GasTrace

With its ultra-fast response time of just 0.2S and detection levels as low as 2ppb, GasTrace offers true real time monitoring, giving full control of all process parameters whilst ensuring consistent quality. GasTrace is capable of monitoring up to 64 individual sample species in real time.

Features of GasTrace systems include:

- **Multiple inlet arrangement (Up to 64), meaning that the user can monitor several process stages (e.g. ASU's) ensuring good control and product integrity thus enabling efficiency to be calculated**
- **Ability to monitor different species on different inlets**
- **Full integration into PLC / control systems, allowing automatic control of gas feeds**
- **Automatic switchover of inlets, with user definable sample times on each line**
- **Data storage in individual files for each inlet, time and date stamped**
- **Automated operation possible**
- **Ultra-fast response time of 150 mS, ensuring that all process events are captured**
- **Real time monitoring of up to 64 gas species**
- **Direct injection of sample gases directly into the ion source via membrane or Capillary inlet**
- **Fully Quantitative analysis (with calibration gas)**
- **Extremely low detection levels**
- **Remote stop/ start function**
- **Corrosive gases option**

All GasTrace systems feature a 200 amu (300 optional) precision Mass Spectrometer with ultra gas tight ion source in a high throughput all metal analyser housing. High vacuum is provided by means of an 80 l/s turbomolecular pump (300 l/s in H2 or He applications) backed by dry diaphragm pump. All-metal construction of the vacuum system ensures the utmost integrity and ultra low background levels.

Operation and Control

GasTrace instruments can be linked to several points on the plant to provide direct feedback, monitoring and control of the Gas composition.

Normally, GasTrace is connected to the reactor by means of pressurised sample lines from the plant / feedstock line with a small bleed flow of gas (around 200 ml/ min) supplied to the instrument, past a T-piece containing the mass spectrometer inlet, and the instrument set up to run the sample gases vs time, with the software configured to record the data either as a percentage of the bulk gas or as individual intensities / concentrations. Outputs can be directly fed to the process control system to control the gas feeds if required. The result is that the gas composition can be very closely controlled, thus helping to maximise the integrity. Permanent integrity of the process is achieved at all times.

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Environmental Application

Compact, Real-time Gas Analysis for Environmental Applications

EcoSys-P

From ESS Ltd

The latest model of EcoSys- P builds on its already proven design and capability. Now with significant improvements and additions over the previous model, EcoSys-P raises the benchmark in portable instrumentation to an unsurpassed level.

Ultimate Flexibility - these portable systems now benefit from being equipped with BOTH a membrane and capillary inlet arrangement. The membrane inlet is equipped with an active circulation pump for use in ambient applications and offers low PPB level detection for most VOC's.

Ultra fast analysis with high sensitivity

With use of the optional High volume sampling pump, analysis gas can be drawn from up to 800m away. With a response time of 1s, this inlet is suitable for real-time analysis. The capillary inlet is an ultra-fast inlet with a response time of a staggering 100mS. This inlet gives true real time measurement, and is suitable for sampling from up to 2m away.

A new design of ion source improves the signal to background ratio significantly, thus giving rise to lower background levels and greater sensitivity.

State of the art electronics now incorporate an Ethernet connection to the laptop, meaning that EcoSys-P can be either connected to a network or operated wirelessly using the wireless option.

As always, EcoSys-P is constructed to ESS ultra high levels of build quality ensuring the very best in portable instrumentation is supplied to you.

Typical Application Areas Include:

- **Hazardous area monitoring**
- **Environmental Monitoring**
- **VOC's**
- **Fugitive Emissions**
- **Duct and Stack Measurements**
- **Gas Scrubber sampling**

Plus many other application areas

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Tel: +44 (0)1606 49400 | Fax: +44 (0)1606 330937
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EcoSys-P

EcoSys-P is capable of sampling virtually ANY gas species up to 200 (300 optional) amu over a very wide range of concentrations. In its standard configuration, with the EcoSys-P you can:

- Monitor up to 64 sample species in real time, either quantitatively or qualitatively
- Generate time and date stamped results
- Identify unknowns
- Operate the system from a remote location
- Set Alarm levels on any channel
- Send data to other devices by Analogue outputs (4)
- Generate ASCII files for incorporation into other programs (e.g. Microsoft Excel)
- Monitor to PPB levels in real time

Powerful Software Package

The system comes with a very powerful, yet easy to use software package, preloaded onto a laptop. Offering fully quantitative analysis of up to 64 channels in real time, EcoSys can now be operated over a network, or controlled via the internet for remote, unmanned operation, servicing, customer support and two way file transfer.

Options and Accessories for the EcoSys-P

EcoSys-P is designed to be fully flexible and suitable for a wide range of applications. With this in mind, ESS has several options available, such as:

- NIST Library filemaker - this option collects, collates, sorts data and converts into a format that the NIST library of 200,000 compounds can interpret and use to identify unknown components
- Water / Liquid Probe (LiquiTorr) for aqueous samples
- Field Power Pack - provides remote power for up to 8 hours operation
- Vehicle Adapter kit- allows either Field Power Pack to be charged or provide power to the EcoSys-P
- Wireless Modem option – EcoSys-P can be driven from a remote location from anywhere within the wireless network range.
- GPS - Location can be transmitted to EcoSys-P by Analogue Input
- Ultratrace-PPT - this is the addition of a Thermal desorber which brings the detection level down to PART PER TRILLION (PPT) levels for VOC's

For longer runs, scans can be set by making use of a pre-set timer (user definable), and processes such as zero, calibration and measurement can be fully automated to simplify operation.

A powerful data review package is also included, which allows for quick, easy conversion into an ASCII format. 3D review of analogue scans is also included.

Areas of particular interest can be studied in further detail by making use of the magnify / cursor option.

ESS Ltd
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Tel: +44 (0)1606 49400 | Fax: +44 (0)1606 330937
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Web: www.essco.com

Environmental Application

Portable power option for the EcoSys-P

Field Power Pack

From ESS Ltd

The Field Power Pack from ESS is a useful add-on option to the EcoSys-P system, particularly in applications where there is little mains power available. It allows the user to operate directly from the 24V supply for a period of up to eight hours, which can prove invaluable in applications such as:

- **Stack Monitoring**
- **Remote area emissions monitoring**
- **Remote area liquids sampling**
- **Emergency Service Hazardous Chemical Identification**

It is supplied complete with an in-vehicle charger, meaning that the Field Power Pack can be charged whilst the user is travelling to site, or this can be used to provide a 'top-up' charge whilst the instrument is in use. Connection to the EcoSys-P couldn't be easier, simply plug it into your EcoSys-P via the plug on the rear panel, and with up to 8 hours operation, now you really can 'take the laboratory into the field'.

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Enviromental Applications

Evolved / Dissolved Gases in Liquids

LiquiTorr

From ESS Ltd

The LiquiTorr Liquids Analysis is an add-on option for our EcoSys-P and other products in our range, and enables the user to conduct real time Quantitative measurement of dissolved or evolved gases and vapours in liquid samples. LiquiTorr uses permeable membrane technology which acts as a barrier, allowing the dissolved gases to permeate into the MS, whilst preventing the liquid from passing. Its unique design gives LiquiTorr the capability to address a wide range of applications, such as:

- **Hydrocarbon Fracturing (Fracking) liquid analysis**
- **Oil / coal sands monitoring**
- **Groundwater studies**
- **Methane Production control**
- **Contaminated water courses**
- **Remote area liquids sampling**
- **Emergency Service Hazardous Chemical Identification**
- **VOC Monitoring in Liquids**
- **He/D2 measurements**

Supplied complete with on-board peristaltic pump, sample gas is drawn through the LiquiTorr cartridge, in which evolved gases pass through and into the Mass Spectrometer for analysis. An in-line particle filter (replaceable consumable) prevents blockage of the sample cartridge, while the natural enrichment properties of the membrane material make LiquiTorr extremely sensitive, particularly for VOC's and Sulphur compounds. Sub-ppb level detection is possible for these analytes.

LiquiTorr is housed completely in a stand-alone enclosed unit, and sample liquid is continuously circulated through the unit. Agitation of the sample is not required.

An integrated optical shut-off sensor protects the mass spectrometer at all times, ensuring fail-safe operation, and its rugged design makes LiquiTorr suitable for field and laboratory studies alike.

Our experts will be happy to talk to you about your application and will always endeavour to not only meet but exceed your requests and requirements.

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Industrial Process & Plant Safety

Hazardous Area Gas Monitoring and Control

EnviroSafe

From ESS Ltd

EnviroSafe Mass Spectrometer systems from ESS detect, track, and monitor leakages and process issues of Hazardous substances in real time, and provide a highly cost effective solution to a multiple analyser approach.

Specifically designed for Hazardous Species gas phase monitoring, these systems offer unparalleled performance in terms of sensitivity, speed, response time and report generation capabilities. Their capability to monitor virtually any hazardous species makes them the system of choice for plant applications, and ensures compliance with any regulations or codes of practice that may be in place.

Housed within a compact, space saving cabinet gives the user flexibility of the location of the system, and a fully ATEX Zone 1 version is available should user wish to locate the system within the Hazardous area itself.

Up to 60 Individual sample points can be monitored with EnviroSafe, often meaning that an entire plant can be monitored with just one system. All sample points are continuously pumped, ensuring that 'fresh' sample arrives at the Mass Spectrometer when that sample stream is selected with no dead volume delay. The measurement time on individual sample points is user selectable, and can be measured in any desired order. With full, automated unattended operation and integration into the plant control system, together with automated report generation, these systems are ideally suited to many Hazardous area monitoring applications, including:

- **Vinyl Chloride / DCM Manufacture and pilot plant**
- **Urea / Ammonia plant**
- **Ambient Solvent monitoring (eg Toluene, Styrene, Benzene, etc.)**
- **Chlorinated compounds**
- **Mercaptans and Amines**
- **Gas scrubber monitoring**
- **Enclosed / confined workplaces**
- **Corrosives**

Real-time monitoring of up to 64 individual sample species with full alarm and control capabilities ensure that the complete process is measured, ensuring that no events are missed. With true on-line monitoring capabilities, EnviroSafe offers a faster, more reliable analysis method than traditional techniques.

ESS Ltd
GeneSys House | Denton Drive | Northwich | Cheshire | CW9 7LU UK
Tel: +44 (0)1606 49400 | Fax: +44 (0)1606 330937
Email: sales@essco.com
Web: www.essco.com

EnviroSafe

A very high sensitivity Quadrupole analyser, equipped with an enhanced gas tight enclosed ion source, EnviroSafe offers a broad dynamic range with detection capability from low ppb levels tight through to high percentage levels. With a response time of just 0.2s, EnviroSafe offers the following features in order to ensure full workplace compliance monitoring:

- **Fast Response - 0.2s response time gives true real time monitoring**
- **User selectable sample times**
- **Full report generation suite, including time weighted averaging (TWA) per sample point, maximum and minimum levels and full statistical analysis. Time and Date stamped reports**
- **Data Storage in individual files for each sample point**
- **Ultra low level detection**
- **Automated report generation and printout**
- **Designed for plant applications**
- **Full alarm integration / klaxon/ SCADA interfacing to ensure worker exposure level (WEL) is not breached**
- **Wireless operation option**
- **LAN Interfacing- instrument can be monitored / operated from plant control room**
- **Up to 64 Sample points (in banks of 10) all continuously pumped**
- **ATEX option**
- **User definable alarm levels for different areas of plant (eg Lower level in enclosed areas)**
- **Automated calibration ensures integrity of results**
- **Ability to activate / deactivate sample points as required (e.g. switch off when areas of plant are not active**

EnviroSafe systems are based upon ESS field proven technology, with its unparalleled reliability record. Coupled with unrivalled application support, these systems represent the very best in workplace exposure monitoring.

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Fermentation Applications

Fast multi Vessel Analysis of Fermentation Processes

FermenTorr

From ESS Ltd

FermenTorr from ESS gives fast, accurate measurement and control of Fermentation processes and can be used to document progress and ensure end-product quality.

In production scale and pilot plant scale fermentation systems, usually there is a great deal of emphasis placed on the product yield. By monitoring the off gases from each vessel during the fermentation cycle, calculations of the respiratory quotient, Carbon production rate and Oxygen uptake are straightforward and included in the powerful software suite.

These systems can be fully integrated with the Fermentation System software, meaning that stop /start interactions between the two can easily be activated.

In applications where there is a requirement to monitor multiple fermenters, ESS has developed the 'MultiStream' ultralow volume autosampler. With this arrangement, sample gas is drawn from all of the sample points all of the time, with the sample from the specific vessel under measurement being diverted to the Mass Spectrometer. This arrangement ensures that fresh, real-time sample arrives at the instrument for measurement, and gives rapid switchover times between sample points with minimal 'dead time'. Up to 60 sample points may be monitored (these are selected in multiples of 10), and with 64 channels available for species monitoring, FermenTorr gives maximum flexibility for all Fermentation applications.

Features include:

- Individual data storage for each sample point - time and date stamped data gives a true historical record of the process performance of an individual vessel
- User-definable analysis times on each vessel - this gives the user full flexibility, especially in instances where fermentation vessels are at different stages of the fermentation process. For example, it may not be a necessity to have long analysis times on vessels that have just started 'in process', whereas those that are nearing the end of the cycle may require longer analysis times

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FermenTorr

Features include (continued):

- Up to 64 gas species - the rapid analysis speed of the FermenTorr system means that Quantitative analysis of up to 64 individual off-gases may be performed
- High and low flow configurations - system may be configured to suit the application requirements
- Multiple vessel measurement - user specified, in multiples of 10, with rapid switching between sample points
- ESS Precision Quadrupole analyser with high pressure enclosed ion source - this offers excellent speed, sensitivity and stability with longer service intervals due to lower operating temperature
- On-line calculation of Oxygen Uptake rate option
- On-line calculation of CO2 Evolution rate option
- Full Process Monitoring - allows control points to be set and monitored
- Data exchange with other programs with software integration
- All metal vacuum system - ensures maximum integrity

FermenTorr systems are based upon ESS field proven technology to ensure maximum up time with minimal maintenance. Full application support is provided.

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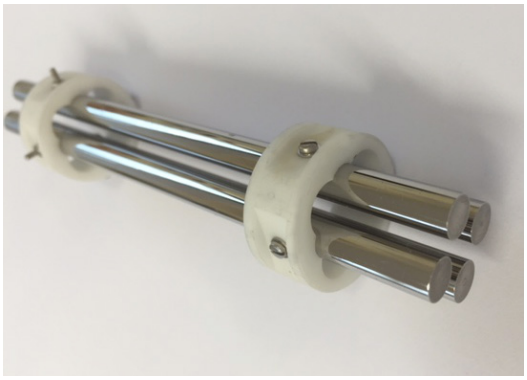
RGA Applications

Quality RGA Instrumentation

InSight

From ESS Ltd

InSight from ESS offers high performance instrumentation for RGA applications at a realistic price range. It has been specifically designed for the following applications:



- **High Vacuum RGA**
- **Ultra High Vacuum RGA**
- **High vacuum leak detection**
- **Surface Science**
- **Molecular Beam Epitaxy (MBE)**
- **Synchrotron applications**
- **Other high vacuum studies**

InSight offers a choice of either 200 or 300amu mass ranges (a special 1 to 5 amu High Resolution option is available for He/D2 studies).

The InSight analyser head is constructed entirely from UHV compatible materials, and features a low surface area, open mesh ion source with low outgassing characteristics and twin thoria filaments.

The mass filter is a precision ground quadrupole array aligned by precision ground high alumina ceramic collars, and at a length of 125mm, it provides excellent resolution and transmission characteristics. Detection is made by a dual Faraday Cup / Channeltron electron multiplier (air stable) detector, giving excellent gain, low noise characteristics and long term stability. The analyser is mounted on a 70mm conflat flange.

The RF Generator couples to the analyser by means of a 1.2m 'elephants trunk' cable, and is equipped with variable potentiometers for Resolution (high and low end) and Mass Scale (high and low end) as standard.

The InSight controller connects to the RF Generator by means of a cable, and the controller houses the analyser and RF power supplies and USB interface. Front panel adjustment of the analyser parameters emission current, focus voltage, ion energy and electron energy are standard.

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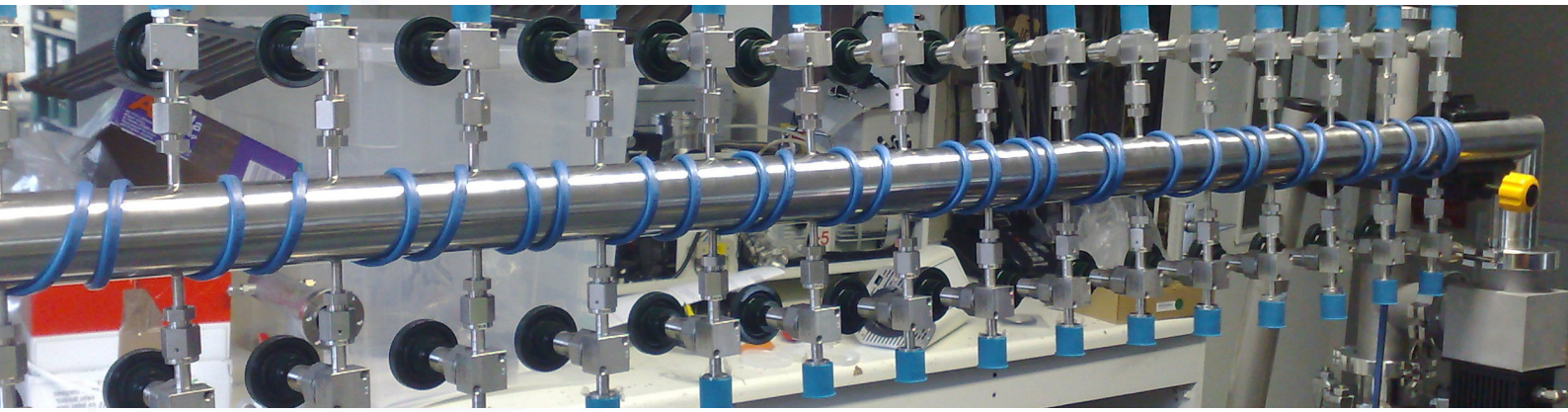
InSight

A comprehensive, easy to use software package provides the following powerful features:

- **Analogue scan with 'overlay' feature**
- **Bar Graph Scan with background subtraction**
- **Leak Detect Mode**
- **20 Channel Multiple ion display mode with full history and automatic data storage**
- **20 Channel concentration display with full history and automatic data storage**
- **Process mode, giving simple graphical status of any particular channel**

Up to eight InSight controllers can be connected to a single PC and operated simultaneously.

InSight can also be integrated into low budget systems - please contact us for further details.



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TGA Applications

Mass Spectrometer System For TGA/DSC Applications

ThermaSys

From ESS Ltd

ThermaSys from ESS sets the benchmark in real-time monitoring of Thermogravimetric and Evolved Gas Analysis applications. Specifically designed for TGA-DSC applications, this system benefits from years of research and listening to customer requirements. ThermaSys offers the ultimate in performance within a space-saving compact cabinet, allowing the system to be positioned next to the TGA apparatus, while the flexibility of Ethernet connection gives the user the ability to operate the system over a local area connection (LAN).

Due to the ultra-fast response time of 120mS, coupled with low detection levels, the complete process is measured, ensuring that no events are missed, offering a significant improvement over other techniques as improved control can be immediately implemented, thus maximising the information produced during the run.

ThermaSys instruments can provide two types of analysis and control, these are direct feedback monitoring and control of gas phase composition or a calibrated continuous record of the entire gas phase. Equipped with Analogue inputs as standard, Gas composition changes can be plotted on the same screen as the temperature and weight loss.

Supplied with a specially designed high temperature capillary inlet as standard, its ultra-fast response time can track even the fastest of change in conditions, which can often be vital when determining the temperature of product release.

The high sensitivity dual detector Quadrupole Mass Spectrometer (QMS) of ThermaSys offers a broad dynamic range, with detection capability from low ppb/ ppm right up to high percentage levels.

With full software control of the vacuum system, all operating parameters can be adjusted directly from the PC.

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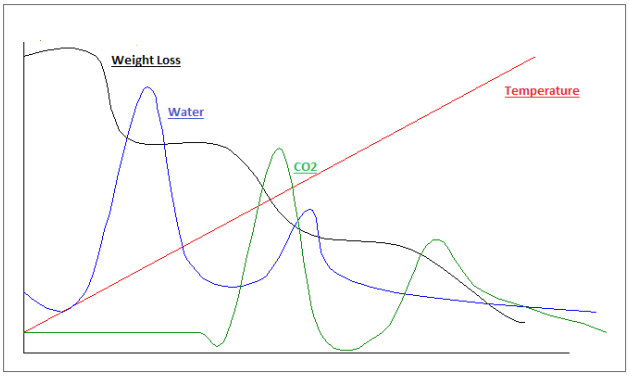
ThermaSys

ThermaSys is the instrument of choice for:

- Thermogravimetric analysis
- DSC applications
- Material sublimation / desorption
- Oxidation and reduction
- Loss of volatiles
- Materials characterisation

This system has been designed specifically for TGA-DSC applications, and users can benefit from:

- High Temperature Capillary inlet as standard (20ml/ min standard, 'low flow' option of 10ml/min optional)
- Analogue inputs - to record parameters such as weight loss/ temperature on the same screen as gas composition
- Integrated stop/start with TGA software
- Simultaneous monitoring of furnace temperature
- Ability to send data 'live' into other programs - data can be immediately exported into other formats e.g. TGA software
- Fast response time - with a response time of 120mS, true real time monitoring of the process is achieved
- Oil free vacuum system - Hyrdrocarbon free system ensures no interferences, with minimal maintenance required
- Autofrack



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