

# EC<sup>2</sup>S

## EMULSION CONCENTRATION CONTROL SYSTEM



THE ULTIMATE SYSTEM  
FOR MONITORING &  
REGULATING THE COOLANT  
EMULSION'S CONCENTRATION

A Step Ahead

# QUALITY AND STABILITY OF THE COOLANT EMULSIONS

ECS is the ultimate system for measuring and regulating the water/oil concentration for lubrication cooling solutions in the industry.

Its functionality scheme is relatively simple: an emulsion sample is taken at regular and programmable intervals from the tank using a suction pump, or, in systems with an above-ground tank, through a valve.

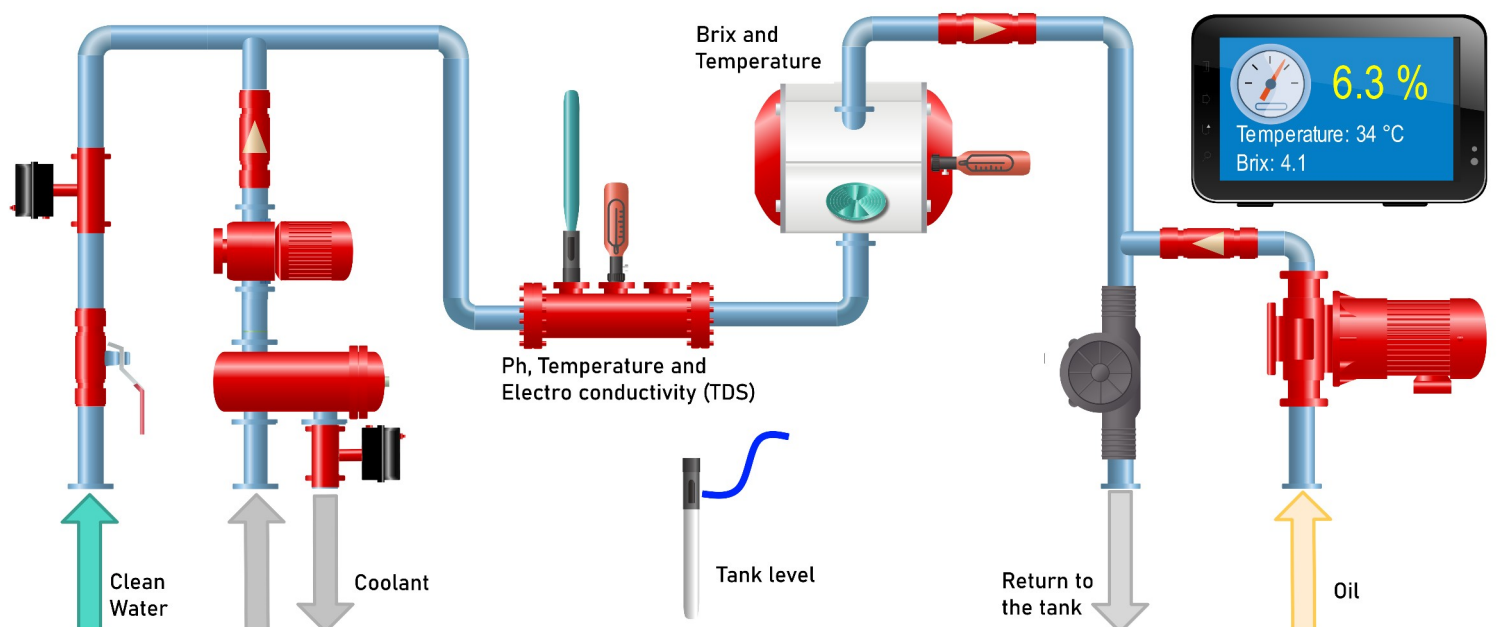
After being filtered both mechanically and using a magnetic filter, the physical parameters of pH, temperature and electrical conductivity are measured in order to also keep these parameters under control, the oil concentration is then measured. Results are shown in real time on the display and tracked for deviation's trend analysis.

The magnetic filter has an embedded cleaning circuit so to carry out a cleaning cycle automatically or on demand, guaranteeing its efficiency over time.

The concentration measurement is carried out with a thermoregulated total reflection refractometer. This unit represents the heart of the system and was designed specifically for the application. The thermoregulation guarantees precise measurements even in extreme conditions and with emulsions where the variation of the refractometric index is strongly influenced by the temperature. The refractometer also has a cleaning system, in this case it is ultrasonic and capable of keeping the system functioning for long time span without need for maintenance.

Once the measurements has been done, the coolant is reintroduced into the tank from which it was taken. If the concentration it is not within the expected range, the water inlet valve and the oil suction pump are activated so to introduce an emulsion with a higher or lower concentration as required. The two elements are mixed by a static mixer.

Finally, a flow meter counts the quantity of water and new oil introduced into the circuit, while a level meter constantly monitors the level of the emulsion in the tank



# Technical specifications

|                                          | ECS – Model Smart P20-01-7                                                                           |
|------------------------------------------|------------------------------------------------------------------------------------------------------|
| <b>Concentration,s Measurement Range</b> | 0 – 20 %                                                                                             |
| <b>Accuracy</b>                          | + - 0.1%                                                                                             |
| <b>Oil's Refractometric Index Range</b>  | 0 - 5                                                                                                |
| <b>Emulsion's Temperature Range</b>      | 5 – 80 °C                                                                                            |
| <b>Ph Range</b>                          | 2 - 12                                                                                               |
| <b>EC Range</b>                          | 0 - 9990 us/cm                                                                                       |
| <b>Cleaning System</b>                   | Mechanical/magnetic filter with self-cleaning circuit, piezo-ceramic ultrasonic element (40kHz, 50W) |
| <b>Emulsion's suction height (max)</b>   | 3 mt                                                                                                 |
| <b>Oil's suction height (max)</b>        | 2 mt                                                                                                 |
| <b>Water inlet pressure (max)</b>        | 4 bar                                                                                                |
| <b>Flow rate</b>                         | 1-1000 lt/hour                                                                                       |
| <b>Hydraulic fitting size</b>            | 1/2"                                                                                                 |
|                                          |                                                                                                      |
| <b>Power supply</b>                      | 220 Vac 150 W                                                                                        |
| <b>Network Connectivity</b>              | Ethernet/WiFi/ 4G/5G (HTTP, MQTT, ModBus)                                                            |
| <b>Cabinet Dimensions</b>                | 600 x 1800 x 300 (mm)                                                                                |
|                                          |                                                                                                      |
| <b>User Interface</b>                    | 10" touch LCD screen/Web interface                                                                   |

*Note: some parameters may change or be agreed upon during supply.  
Contact the technical and commercial references for a better definition of these.*

# SYSTEM'S ARCHITECTURE

The system uses two separate IP67 grade waterproof cabinets which are usually placed one on the other.

The upper cabinet contains the electrical and electronic part and is based on a Siemens Micro PLC and a smart LCD touch screen operator panel plus two hardware push buttons for starting and stopping the measurement cycle plus the emergency push button.

The wiring is made using colored terminals so as to be immediately identifiable.

The hydraulic part is made with materials that are absolutely compatible for the treatment of the aqueous emulsion; copper fittings and its alloys are therefore avoided, preferring plastic materials for the scope.

Even stainless steel, although present where necessary (for example in the valves) is reduced to the minimum, preferring aluminum to eliminate the risk of corrosion of parts which might be caused by galvanic currents.

The valves responsible for controlling the flows are ball models with automatic self-closing feature, in the way to have a gradual opening avoiding water hammer and, at the same time, be sure to restore the closed state in the event of a power failure. All hydraulic components use swivel fittings to be easily dismantled, with FKM (Viton) seals.

The emulsion suction pump from the tank has a suction capacity of over 3 meters, while the pump for introducing and regulating the addition of oil is modulated by the software in order to guarantee the correct regulation of the oil concentration.

The inlet filter operates both mechanical and magnetic filtering and to be easily inspected as well as having a self-cleaning circuit.



# SIMPLIFIED INSTALLATION

## REDUCED MAINTENANCE

Electrical installation is quick, being necessary only the simple connection of the 230 VAC power supply. To connect the system to the network a standard Ethernet or Wi-Fi connection can be used. Finally, the system can be equipped with a 4G/IoT-NB router for remote monitoring on a secure network.

To correctly operate, the ECS system requires some pipes to collect and reintroduce the coolant into the containment tank. The pipes can be made of polypropylene, PVC, composite etc. the only precaution at least for the emulsion and oil inlet lines is that they are in rigid pipes.

ECS cabinet can be installed on the edge of the tank as well, by fixing it to the wall or using a suitable support in the proximity of the tank.

The hydraulic system will follow the indicated scheme:

A: Water inlet

B: Emulsion inlet to be monitored

C: Filter cleaning drain

D: Oil inlet

E: Return of emulsion into the tank



About maintenance, the system has a mechanical and magnetic cleaning solution which may be an automatic or manual cleaning cycle according to the use. This cycle occurs by let circulating clean water into the filter and drained it into a special container or even directly into the tank. The refractometer is equipped with an ultrasonic cleaning system which is automatically activated at each measurement cycle.

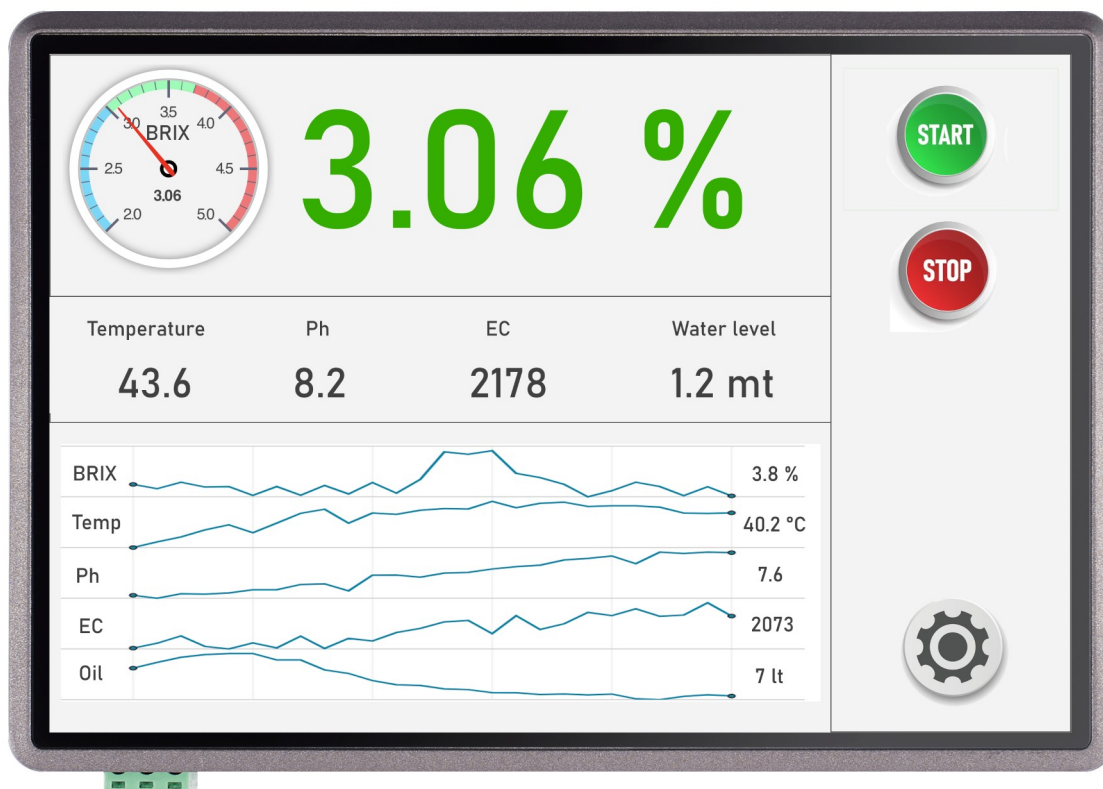
Therefore it does not require any ordinary human intervention.

Where the system remains inactive for a long time, an oil's film may create deposit on the surface of the measuring prism. This event is signaled on the operator as a form of software alarm on the main panel and have to be solved with a manual intervention, which is not complicate anyway.

All hydraulic components use swivel fittings and can be dismantled extremely easily even by non-specifically trained personnel.

# SOFTWARE, CONNECTIONS AND REPORTING – INDUSTRY 4.0

Software architecture uses a Siemens micro PLC for the specific functions of signal handling and electromechanical components activation. The LCD panel, beyond performing user interface functions, represents the most suitable and complete component for data collecting and storage, network connectivity and reporting. The system used is in effect a powerful Linux based embedded system with extensive computing capacity. The software features are therefore the representation of the measurements, parameters setting and reporting of the measured data, graphically displayed as trends of concentration, pH, EC, emulsion temperature and the values of oil consumption during the time.



The same operator interface is also available via network, using a common web browser.

Furthermore, through network connectivity the system can be interfaced with management and supervision systems, being able to operate with the ModBus, MQTT and API Rest protocols. Finally, the system is set up for remote monitoring via the IoT-NB platform or other mobile gateways in a fully secure way.

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