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# ONLINE POLLUTANT CONTROL IN THE AUTOMOBILE INDUSTRY

## Sources of pollutants

There are many processes in automotive factories in which water is used, and as a consequence of their function, different types of wastewater are generated that must be treated in the company's internal WWTPi before the water can be discharged.

Thus, some of the main components that must be removed at the WWTPi are:

- Lead ($Pb^{2+}$), nickel ($Ni^{2+}$) and cadmium ($Cd^{2+}$), as contaminants from the cataphoresis process.
- Phosphates ($PO_4$), coming from a phosphoric acid bath to protect the plates from humidity and corrosion
- Hexavalent chromium ($Cr^{6+}$), coming from the passivation treatment

All of these should be reduced to levels permitted by legislation in order to be able to dispose of the water outside the factory.

## Pollutant concentrations and discharge limits

The following are approximate starting values for pollutants in water after its industrial function and prior to treatment. These values may vary slightly depending on the plant.

| Parameter | Average concentration [ppm] | Maximum concentration [ppm] | Maximum allowable instantaneous concentration [ppm] |
|---|---|---|---|
| $Pb^{2+}$ | 23 | 50 | 1 |
| $Ni^{2+}$ | 7 | 10 | 5 |
| $Cd^{2+}$ | 7 | 10 | 0.5 |
| $PO_4^{3-}$ | 110 | 175 | 40* |
| $Cr^{6+}$ | 40 | 90 | 1 |

**40 ppm as total phosphorus*

The maximum permitted instantaneous concentrations are governed according to law 10/1993, of 26 October, on Industrial Liquid Discharges to the Integral Sewage System. Although each community can regulate the maximum values as long as they comply with law 10/1993, as a reference the values shown are reflected in law 5/2003, of 20 March, on waste from the Community of Madrid.

In view of the results shown in the table, the need for the WWTPi to eliminate or reduce the pollutants generated as a result of the industrial process of the car factory is evident.

## Treatment and elimination of pollutants

Different processes and chemical reagents are used to at least reduce the concentrations of all treated elements. Common chemical reagents used in automotive WWTPs are $NaHSO_3$, required for the reduction of chromium (VI) to chromium (III), $Ca(OH)_2$, which reacts with nickel, cadmium, chromium (III) and phosphates, forming different precipitates in the form of hydroxides or calcium phosphate, $Na_2CO_3$ to react with lead and cause its precipitation and $FeCl_3$, used as a coagulant.

## Advantages of online analysis and monitoring

As indicated in the previous point, the dosing of chemical reagents is one of the main costs to be taken into account by the company when treating the wastewater generated. This is why the online control of the pre-treated water allows an adjusted dosage of the reagents according to the concentration of the pollutant at each moment, since the concentration of each of the parameters is not constant throughout the day, suffering variations that the automatic control allows to detect, and consequently, to correctly dose the chemical compounds, causing in turn a considerable economic saving.

On the other hand, the online control of the water once it has been treated makes it possible to verify that the limit values indicated by the legislation are not exceeded, and to act accordingly when these limits are exceeded.

## Economic example of online control

For the economic savings calculations, it is assumed that 1,500 $m^3$ are treated daily (the capacity of SEAT in Martorell, for example, is 30,000 $m^3$/day). The following table shows the approximate consumption of chemical reagents for reduction to the admissible limits. In addition, it is assumed that the online control of a control analyser allows a 2% saving in dosing.

| Chemical reagent | Approximate consumption [kg/day] | Approximate savings (1%) [kg/month]* |
|---|---|---|
| $NaHSO_3$ | 28 – 32 | 12 – 14 |
| $Ca(OH)_2$ | 80 – 90 | 35 – 37 |
| $Na_2CO_3$ | 32 – 36 | 14 – 16 |
| $FeCl_3$ | 110 – 120 | 49 – 51 |

**Assumes 22 working days per month*

As can be seen in the table, the monthly amounts that could be saved are considerable, **around 1,400 kg per year between all the compounds**, resulting in economic savings for the plant.

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## Instran online analyser®


The Instran online analyser is an analyser that allows the concentration of various parameters to be monitored over time, including phosphate, nickel, chromium, etc., with a frequency of 10 to 25 minutes depending on the parameter in question and the measurement technique used.

The equipment's specific cleaning systems allow it to deal with dirty water from wastewater treatment plants, without affecting the measurements with cross interference in subsequent analyses or obstructing the fluid circulation systems. Its simple design means that plant operators quickly become familiar with the equipment and its maintenance is very low, reducing the inconvenience caused by analyser maintenance. All these features make the Instran a unique analyser on the market with exceptional performance for the control of online components in water and its consequent economic savings, as well as complying with current legislation.

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