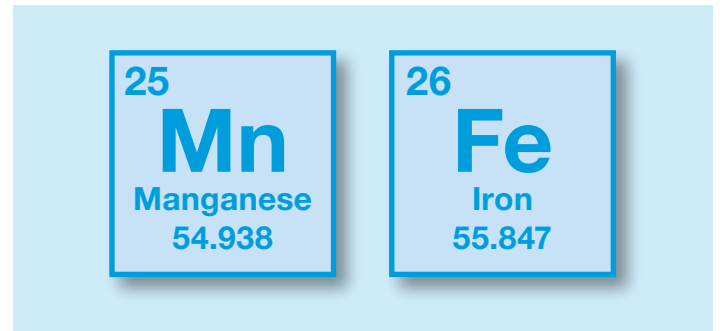


## Iron & Manganese Monitoring in Potable Water

### The Chemicals Iron & Manganese

Manganese is naturally present in soil, surface water and groundwater. Manganese is an important cofactor for large classes of enzymes. Enzymes are proteins that act as biological catalysts, which accelerate chemical reactions. Manganese is an essential dietary element for humans due to its role as coenzyme in several biological processes, which include macronutrient metabolism, bone formation, and free radical defense systems. The human body contains about 12mg of manganese, mostly in the bones.

Iron is by mass, the most common element on earth, right before oxygen, forming much of earth's outer and inner core. The body of an adult human contains about 4 grams (0.005% body weight) of iron, mostly in hemoglobin and myoglobin. These two proteins play essential roles in vertebrate metabolism, respectively oxygen transport by blood and oxygen storage in muscles. To maintain the necessary levels, human iron metabolism requires a minimum of iron in the diet.



The health risks from iron and manganese are small, however there are risks associated with the bacteria that cause raised iron concentrations from corrosion. The lethal dosage of iron for humans is 200-250 mg/kg of body weight, this causes extensive gastrointestinal hemorrhage. Iron intake from drinking water is too low to raise any health concerns, making iron toxicity rare. Nonetheless, iron oxides can be responsible for increased levels of arsenic.

Source waters like groundwater often contain iron and manganese. Manganese is typically present at much lower concentrations than iron. Monitoring manganese and iron ensures no discoloration and bad tastes of the tap water. Related customer claims and the subsequent investigation and measures can be very costly to handle. Turbidity monitoring can raise alarms in case of accidental events (breakthroughs, storms, flooding) or for trend and monitoring of the final product. To meet the customers satisfaction in taste, color or hardness, further specific measurements must be conducted.

### About the Application – Iron & Manganese Monitoring Potable Water

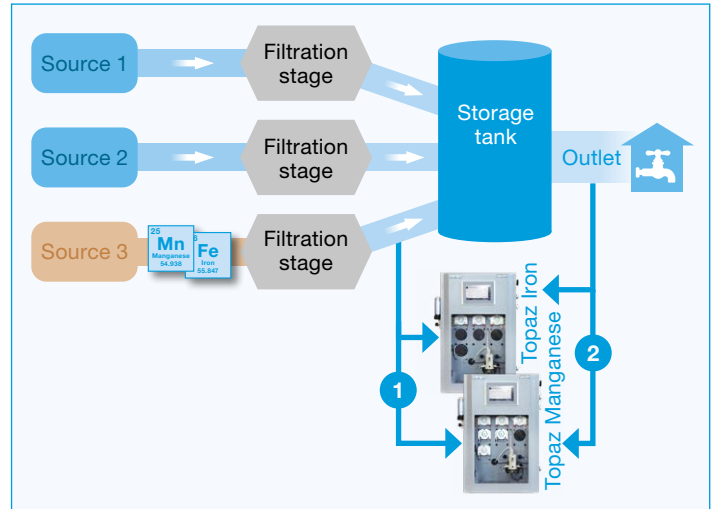
In Chile the local regulation limits of iron is 0.3 ppm and manganese 0.1 ppm. If the levels are above these limits, critical penalties will apply. Therefore, measurements are located at the outlet of the potable water plants and/or after the filtration system. Normally, there are no increased value of iron and manganese in surface water, however,

water wells can be an issue as higher values are expected. The customer is a main potable water provider in south Chile.

After the filtration system of the water sources with this is the main measurement in order to assure that the levels are below the legal requirements.

Each potable water plant has 3 water sources but, in all cases, only 1 water source has problems with iron and manganese. Therefore, only the water source with high levels of iron and manganese is individually monitored (see number 1 in image below).

Additionally, for quality assurance the outlet is also monitored (see number 2). This point should always have equal or lower levels of iron and manganese than the other measurement parts.



## The installation by Swan Chile

As mentioned before, even if monitoring by manual sampling in the laboratory is in line with local regulations and still common practice in many plants, offline sampling in laboratories can cause delays and is discontinuous. The

customer wanted to increase the quality security and therefore changed to continuous online monitoring with Topaz Iron analyzer of Seres OL (A Swan company), supplied by the team of our regional office in Chile



Seres OL Topaz Iron and Topaz Manganese monitors at the customer's site for final product monitoring.



Commissioning and hand-over of the Topaz Iron and Topaz Manganese monitors with the customer.

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