So much water is required for these processes that the cost of the water as a raw material for the plant is becoming an increasing concern especially with growing water scarcity around the world.

To combat the growing cost of water, industrial plants are looking more and more to improve how they are using this resource in their various industrial processes. One important way for plants to reduce their water consumption is to reuse as much water as they can. Water reuse allows water that would have otherwise been discarded to instead be used either again in its original process or for another process in the plant.

CONCERN OF WATER QUALITY
One of the biggest problems with water reuse is water quality. Water reuse requires the plant to use water that is almost always of lesser quality than new water. Contamination of the water with oils, chemicals, metals and organic matter and even with the product being produced or processed can lessen the water quality substantially. The type of contamination as well as the level and variation of contamination will dictate what type of processes the water can be reused for, as well as what type of treatment may be necessary before the water is of high enough quality for reuse.

THE BENEFIT OF ORGANICS MONITORING
Although there are several potential types of contamination that can be found in sources of water for reuse, of particular interest in a number of applications is contamination with organic matter. There are several possible sources of organic contamination of water reuse sources including environmental contact, leaking heat exchangers and product loss, often leading to varying levels of organics as well as unexpected organic contamination events. Continuous monitoring of water reuse sources for organic contamination can therefore be invaluable for effective water reuse programs.

COMMON REUSE APPLICATIONS WITH ORGANIC CONTAMINATION
There are often multiple potential sources of water for reuse in an industrial plant. One of the most common sources of reuse water is condensate. Depending on the particular industrial process, condensate water can be valuable in several ways. Condensate often comes from boilers designed to supply steam to heat various types of processes. The efficiency of this system relies on the system’s ability to return the condensed steam to the operation cycle. This allows the plant not only to recover the used water, it also allows energy savings since the condensate usually retains a significant amount of heat which is recovered along with the water. Since the condensate can become contaminated with organics.
often via the heat exchanger, monitoring the water quality for organic contamination can prevent corrosion from occurring in the system.

Another source of condensate for reuse is evaporators. Evaporators are often used in the food and beverage industry for product concentration. Essentially the product is boiled to extract the water resulting in concentrated product. Evaporation is a commonly used method of product concentration in the production of certain dairy products, juice products and even some liquor products. The evaporated water is then condensed and although it is often fairly clean it can contain varying levels of organic contamination due to product loss from the evaporation process. Monitoring these organics can help determine the potential of evaporator condensate for reuse purposes. In many cases, the condensate can be reused in boiler systems with some treatment. By monitoring the organics the operator is able to make decisions about whether to send the condensate to boilers as makeup water, or simply to divert to drain if the contamination is deemed too high.

Yet another common source of water for reuse is RO permeate from product separation processes. Organic contamination is especially prevalent in this application and therefore this source will require some further treatment to be fit for most reuse applications. Unlike the condensate water, RO permeate does not possess any heat energy and therefore it is not as suited to boiler reuse applications. Instead RO permeate is better reused for applications such as wash water or cooling tower makeup water. Monitoring organics is essential to validate the quality of RO permeate water for reuse applications.

**REAL-TIME ORGANIC MONITORING SOLUTIONS**
Organics monitoring requirements can vary from occasional grab samples to real-time continuous monitoring. For some processes, the water quality is so consistent that real-time monitoring is not deemed necessary. However, if the process producing the water results in a varying amount of contamination, or if contamination tends to occur as sudden and sporadic events then real-time monitoring becomes more valuable.

Due to the complexity and expense often associated with traditional Total Organic Carbon (TOC) instrumentation, real-time monitoring of organics is often overlooked. However, organic contamination can easily be monitored in real-time with the latest generation of photometric and spectrophotometric instruments and with much less expense and maintenance. Spectrophotometric analysis also brings the advantage of being able to distinguish multiple types of contamination with a single real-time instrument. These new analyzers can rapidly detect the most trace amount of contamination, even at ppb levels. Using these latest spectrophotometric instruments, real-time monitoring of organics for water reuse applications is both convenient and cost-effective, allowing for proper control of water reuse.

**CONCLUSION**
Water reuse allows cost savings due to reduced raw water consumption, lowered treatment costs of raw water, and reduction in energy consumption when reusing condensate water. For proper implementation and operation of water reuse in an industrial plant, it is often essential to monitor the quality of the water, including organics, since the sources of water for reuse so often have significant levels of contamination. By monitoring organic contamination levels in process effluents, effective water reuse can be achieved thereby significantly improving the efficiency and cost effectiveness of industrial facilities.