

Improvement of Existing Waste Water Treatment with Monitoring & Control of Environmental Instruments

B.Sc. (Honours) in Applied Physics and Instrumentation

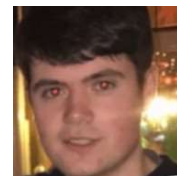


Department of Physical Sciences

Student Name : Timothy Ferris

Supervisor Name : Svetlana Slepneva

Industry Supervisor : Brendan O'Dwyer (O'Dwyer ELC)



Motivation

What is waste water and why this is a problem

- Waste water is a massive problem all over the world.
- Waste water** is produced when fresh water is used by homes and industries in a number of applications including, for example, leaching, flushing, or washing away waste items [1].
- Waste water contains various harmful chemicals which have been introduced to the fresh water during these uses.
- The most basic elements of a healthy lifestyle are a clean-living environment and safe drinking water.

- Water has been misused for decades, where waste water has ended up in rivers and waterways, killing wildlife and fauna.
- Also the waste water can contaminate the water used for human consumption.
- Industrial wastewater treatment** is the processes used for treating wastewater that is produced by industries as an undesirable by-product. After treatment, the treated industrial wastewater may be **safely reused or released** to a sanitary sewer or to a surface water in the environment.

The goal of the project

The project aims to develop and build the waste water treatment skid and create the required automated control system. The skid will be built by a local company for its industrial client.

As a result, the client will benefit from

- the reduction of the chemical disposal costs
- conservation of the incoming water that can be recycled within the facility.

Description of the case

The manufacturing company

O'Dwyer ELC: Specialises in turnkey automation & control systems for multiple sectors from pharmaceuticals to commercial building services solutions. With a broad range of knowledge across multiple disciplines ensures their customers achieve their end goals [2].

- All the work accomplished under the project was completed in the O'Dwyer ELC manufacturing facility.



The client

OMC Technologies: OMC Technologies provide stainless steel fabricated products, cleanroom furniture, stainless steel drainage products, specialist chemical cleaning and surface treatment services to a vast array of clients [3]. Hydrochloric acid is used when performing surface treatment services. The waste water needs to be treated accordingly: pH adjustment and filtration required.

Scope of works

- Create a more user friendly process.
- Increase the efficiency of the plant in order to reduce labour cost and run times.

- Remote access installed for easy modification to the PLC ladder logic/HMI display
- Data log of the treated water after being discharge from the plant.

Waste water treatment steps

- pH adjustment with agitation and settlement.**
- Filtration** in order to extract and concentrate the contaminants. There are two different types of filters used on the skid:
 - ceramic membranes (a bank of filters arranged in parallel),
 - glass polishers (the vessel type filters).

The work accomplished

The work allocated to the student

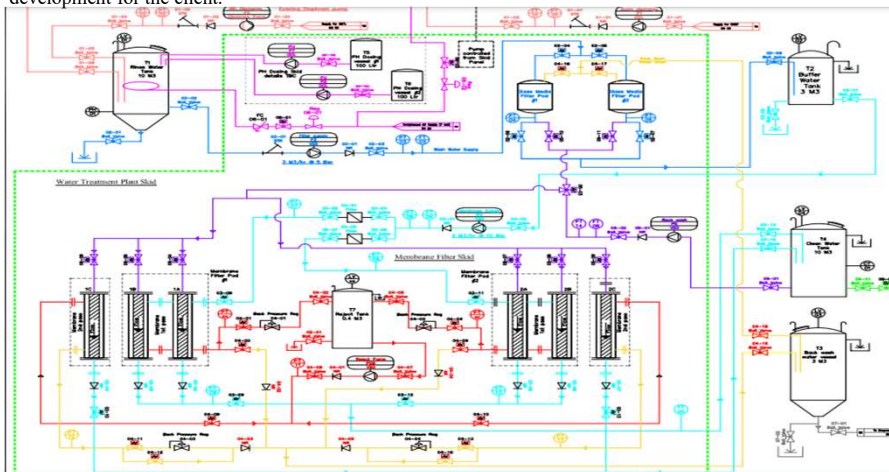
- Design of the electrical schematic for the panel board of the skid and the field.
- Wiring and terminating of the components of the panel board.
- Design of the ladder logic for the PLC program (Siemens TIA).
- Preparation of the vendor documentation.
- Initial factory acceptance testing completed prior to delivery of the skid to the client.

Manufacturing stage



Design Proposal

Piping and instrumentation diagram of the waste water treatment plant. The selection indicates the skid development for the client.



Results

- The skid has passed all electrical & instrumentation and automation & control tests.
- The skid has been delivered to site for the client to manufacture and fit the external pipe work along with the other field devices.
- Commissioning and final testing to be completed.

Conclusion

- Within the project, the waste water treatment plant was developed.
- The process of waste water treatment included pH neutralising and filtration was fully automated.
- All the work allocated to the student was accomplished.