

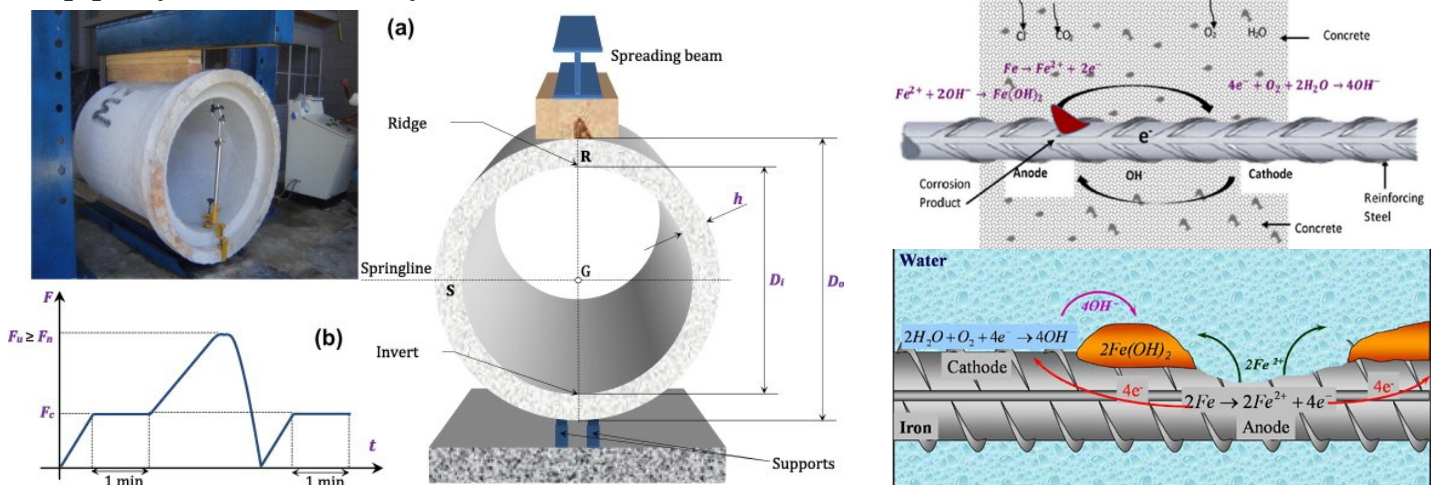
## Bachelor's Thesis, Term Project

### Smart Corrosion Detection and Monitoring System for the Reinforced Concrete Pipes in the Smart Buildings and Constructions based on the Opto-Mechatronics Technologies

**Supervisor (s):** (Assist. Prof. Dr. Eng. Amir Roushdy)

(Assoc. Prof. Dr. Eng. Amr ElNemr) from Civil Engineering Department

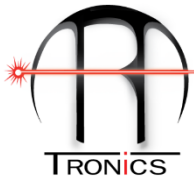
Population growth in the cities in developing countries necessitates the expansion of reclaimed/non-potable water production and utilization. Reclaimed/non-potable water from wastewater has drawn much attention among a wide variety of alternative water resources. It is considered a stable water resource for agricultural, industrial, recreational, and public water. One crucial sector is the construction industry in which expansion in building infrastructures of developing countries like Egypt occurs. However, corrosion of iron and steel components in supply systems can cause water quality deterioration and lead to extra costs for maintenance and deploying the piping streams and network. This study aimed to compare and evaluate the effects of tap water and reclaimed/non-potable water on the corrosion of the inner surface of pipes. **The student will be guided by a Master's student from the civil engineering department in this project with Prof. Dr. Eng. Amir Roushdy and Prof. Dr. Eng. Amr ElNemr from Civil Engineering Department. The main focus will be on reinforced concrete types rather than the pipes systems in this study.**



**Fig.:** Monitoring System for the Reinforced Concrete Pipes

#### Project description and objective:

In this project, the investigated pipes included GSP (Galvanized Steel Pipe), CIP (Cast Iron Pipe), STSP (Stainless Steel Pipe), Reinforced concrete pipes (RCP), and PVCP (Polyvinyl Chloride Pipe). Further, assess the corrosion of the reinforcement at various concrete types manufactured using reclaimed/non-



potable water. This assessment will include analyzing the corrosion accelerators and inhibitors related to the characteristics of reclaimed water and the corrosion impact on the different materials of pipes

### **Research focus of this project:**

- Literature review on the project should be studied properly.
- Not only, creating a software control system for the project but also the hardware.
- Experiments using the gadget and control system should be built properly.
- The outcomes must be documented.

### **Requirements:**

- Passionate to learn more about Automation, Internet of Things (IoT), sensors technology.
- Prior mechatronic design expertise is desired like "SolidWork and Arduino".
- Enthusiasm for completing actual practical work with 3D printing staff (design fabrication and construction) and Sensing Design.
- A method of working that is both structured and self-contained.

### **General tasks of the project:**

- The complete methodology is already available in the ARATRONICS Lab, so we will discuss it from the first day to start the automation process for it
- Fabricate the monitoring system using 3D printer/CNC machine (small parts).
- Assembly all parts of the system.

### **Other notes:**

- A weekly meeting with the advisors will be required for this project, as well as weekly progress updates (**The meeting could be more than once during the week based on your progress and based on your achievements**).
- You should to be in the Lab two days per week (**It could be more than two days based on your progress and based on your achievements**).
- All reports must be prepared in the style of a research paper.
- The outcome of this research will be published in one of the coming international Conferences and , or Journal