

Real Estate Market Index for the Kingdom of Bahrain



Eng. Batool Abdul Aal:

- ▶ I grew up in a large family, with a mother who has a non-negotiable stance when it comes to education!
- ▶ I consistently applied my engineering knowledge in the workplace, seizing every opportunity.

Meedar

Smart Aquaculture System

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Experience Certificates
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One Photograph size 4 x 6 cm with white background
- 5 نسخة من البطاقة الذكية
Copy of ID / CPR
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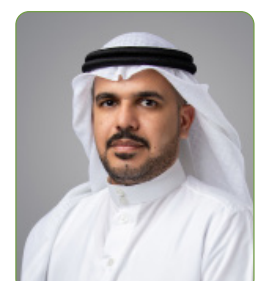
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Speech of the Editor-in-Chief

Dr. Isa Qamber

Based on the Bahrain Society of Engineers message which is the National Society in the Kingdom of Bahrain, it embraces all engineering disciplines, and this is evident through the promotion of male and female engineers from the scientific, technical, and professional aspects of both sexes. This is done through their participation in the activities of our beloved country, the Kingdom of Bahrain. We also do not miss the promotion and raising of these activities from the perspective of various activities in and outside the Kingdom. The promotion of creative values is evident through the creativity in the engineering profession is part of the message. The engineering profession falls under several important objectives as it is needed to achieve the social and economic development of our Kingdom. Creativity is evident in this issue through what the students produced at the end of their undergraduate level, which drove them to produce graduation projects. Offering and exchanging information in this publication within your hands, where an exchange of information occurs between the lines of Al-Mohandis magazine elevates us to achieve the ambitions and aspirations of engineers by delving into many engineering topics in the Seventy Fifth issue of Al-Mohandis.

After highlighting the general message, and the main objective of Al-Mohandis magazine. In this simple introduction and overview, it pleases us to shed light on the female in engineering with her engineering expertise, through which she has

vowed to herself to implement in the service of her country within her career in the Engineering field. Al Mohandis magazine met an experienced Engineers with the values stated above, the engineer Batool Abdel Aal. Her journey began since her school days in Bahrain, followed by her graduate study abroad. Later, she started her career as an engineer at the Electricity and Water Authority, where she mastered her job, as she worked in the high-voltage power station. Do not miss her interview, where a more details of Engineer Batoul's experiences during her career life were shared in the issue.

Afterwards, we move on to this issue's profile, by touching on the aquaculture system, where this system works through a dashboard that monitors oxygen levels through automatic valves. This system is considered a smart system in terms of operation and monitoring as it alerts users using notifications sent to the interactive dashboard. The results of the study are produced as a summary of this smart system, that aims to maintain water quality in tanks, enhance the survival rate of fish fingerlings and increase production levels in the fish farming center hatchery.

In this context, we cannot miss the chance to point out some of the issues that are considered among the tasks of the Bahrain Society of Engineers, which is the dissemination of engineering information that is of interest to the society in which we live.

The researcher, Wafaa Al-Ghatam, defines the term city, and the purpose of cities. She also defined the concept of the rooted city. As for the work of cities, it falls under their design and the start of their establishment, as she goes deeper into their structure, and beyond that. One of the important things that we must get acquainted with is the idea of the two intertwined communication networks, which have their geometric and metric characteristics. Among the networks is a network that serves the local economy, and organized by two factors, social and cultural. In extension to the same topic, this article follows by engineer Susan Ajjawi article to complete the topic of sustainable cities and defined the environment in the countries of the Arab States of the GCC. Therefore, sustainable cities or what is called green cities, i.e., the eleventh goal of the Sustainable Development Goals 2030 is well defined for sustainable cities. One of the advantages of these cities is that they reduce the use of energy, food, and water. It is also hidden to us that these cities undertake to reduce greenhouse gases, waste, and reduce water and air pollution.

Furthermore, among the matters that are considered one of the tasks of the Bahrain Society of Engineers is to address a project for one of the complexes in the Kingdom of Bahrain. A soil investigation test was conducted in the soil laboratory for the complexes, and this test indicated that the ground soil encountered at the site was a weak layer of limestone quality, and this necessitated the design of the isolated base option for the project. One of the researchers touched on the issue of wireless charging for electric cars, and as an example he touched on the car industry through the Swedish car, Volvo. In conclusion, testing new charging technologies is a good way to evaluate alternative charging options for future vehicles. Also, one of the

researchers included a topic in which he deals with bringing industry closer to the academia through industrial equipment, and this rapprochement is considered as the ability of academic media to approach the industrial sector. The index of the real estate market in the Kingdom of Bahrain plays a major role, as was followed by another researcher touching on the recovery and development of the real estate market in the Kingdom. From this point of view, we obtain that the market gives the opportunity for investment and recovery, and this increases the pace of the economy. Planting mangroves in the Kingdom is also a sustainable solution against climate change, and this is what one of the researchers discussed in this issue. The increasing boom and invention of electric vehicles (cars) has support in this number as one researcher listed that as technology continues to improve, consumers are expected to become more committed to reducing their carbon footprint, and environmental destruction concerns are addressed.

The future engineers also worked on their graduation projects, including the East Hidd City project, which was built by the Ministry of Housing. In their project, solutions for some of the observations and errors in the design were presented for treatment. This was followed by the second project, which is the design of a robot that does not require human effort to clean the beaches, and this robot is an automatic device that works on all beaches and is considered environmentally friendly and cleans the beach without the use of human hands. As for the third project, it was based on the idea of designing a smart robotic device, or it could be called a smart robotic woman which is called a smart robotic nurse. This nurse is used in treatment, as its exploitation is an alternative to the nurse who does not touch patients, as was the case during the pandemic period (Covid-19).



Speech of the Managing Editor

Eng. Ayaa Shawqi Al Mahal

Towards another fifty years of giving, and engineering achievement and creativity

I have the honor to present a new issue of the Engineer Magazine, which is Issue 75. On behalf of myself and on behalf of my fellow members of the editorial board and employees of the magazine, I welcome all visitors to the magazine, whether researchers interested in publishing their engineering products or wishing to benefit from the magazine's articles. Since its inception, the magazine has been among the most important sources of information that it seeks to spread knowledge and present it according to the principles of scientific research, which is characterized by originality and effective contribution in the field of engineering, and to represent the product of our present time and the latest developments in the projects and stories of our experienced engineers who did not hesitate to shape our future and our engineering legacy after 50 years and a year of giving, this year we continue to document our contributions and our march to pave the way and turn ideas into reality and inspire engineers to innovate and solve huge problems and facilitate the lives of individuals and serve the community and also answer many questions and perhaps raise other

questions and keep the mind always thirsty and ask God bless.

As usual, we document the present and the new to link the past and the future...academia and work... theories and reality. We highlight the engineers' output, efforts and great services. We leave traces of a better future and references that remind us of what might have been better solutions or other ways.

In conclusion, we thank everyone who contributed to the establishment of the Engineer magazine and the efforts of its former chief editors and the preservation of its distinguished appearance, and the president of the association for this session, Dr. Raeda Al-Alawi, and we urge all engineers to express their suggestions and communicate with the information committee of the association in case of inquiries or the desire to present their articles;

May you always be successful, always forward, towards another fifty years of giving, and engineering achievement and creativity..

Eng. Batool Abdul Aal:

- ▶ I grew up in a large family, with a mother who has a non-negotiable stance when it comes to education!
- ▶ I consistently applied my engineering knowledge in the workplace, seizing every opportunity.



Interviewed and prepared for publishing by: Husain Ismail

Breaking Walls

Her path, since her graduation as an engineer from the University of Basra in 1979 until her retirement as The Executive Vice President for Electricity and Water Production and Transmission and the Electricity and Water Authority in 2014, was not paved and furnished with flowers! It was a long, challenging journey full of patience, perseverance, seriousness, and glory as its goal. Here, through "Almohandis" magazine, Engineer Batool Abdul Aal, reviews some of the important milestones in her journey and career that she spent in the field of engineering for 35 years.

Between medicine and engineering!!

I grew up in a large family with 24 brothers and sisters. I lost my dad when I was 2, so my mom was left to take care of us. My mom used to help me study on the cool open roof; she had a non-negotiation policy on education and instilled in us that "great things will happen" when you do well in school. As far as I was concerned, the tiny Middle Eastern island of Bahrain was the center of the world, and I was determined to find my place in it.

I remember the daily walk back and forth from school as a trip and adventure filled with the sounds and smells of my childhood. I was 11, walking the weaving roads,

past the old souq, toward school with my younger sister, Mona. Every corner road we turned, more girls would join our path, like an orchestrated daily ritual. Our school uniform bonded us. The distinct khaki vest, navy blue skirt, navy emblem, blood-shot eyes, and two ponytails were a fashion statement at the time and filled us all with pride.

One day, in particular, changed the direction of my life. I distinctly remember Mona holding her notebooks close to her chest, clasping a half-eaten Bambar fruit with her fingers. The Bambar fruit is a small, sweet, crunchy fruit that leaves our fingers sticky for a significant part of the day. It would help hold the hunger before we got home for lunch.



Batool Abdul Aal with a group of scouts in the secondary school.

As we approached the doorsteps of the house, hungry and tired, we saw my two brothers, Hussain and Abbas, arguing at the door.

"Why.. can't we both be doctors?" Abbas hesitated as his older brother empowered him.

"We can't all be doctors, Abbas! I'll be the doctor, and you be the engineer!" exclaimed Hussain.

"But I want to be a doctor too..." Abbas hesitated.

I could see the frustration on Hussain's face as Abbas' insistence was eating his patience. "Enough, Abbas, I am the doctor, and you are the engineer! This will be the last time I ask you nicely," Hussain claimed, raising his forbearing hands above his head, ready to pounce at Abbas. "WHAT do you want to become again!?"

Abbas did not hesitate. He stood as tall as possible and let out a small chirp, "...a doctor."

Before anybody could react, Hussain slapped Abbas across the face with all the couped-up anger and frustration. "You still want to become a Doctor?!"

Abbas put his hand on his cheek, straightened himself out, and, with conviction, exclaimed, "yes, a doctor!"

"Fine, go become the doctor..."



Batool Abdul Aal holds a Bachelor's degree in Electrical Engineering from University of Basra, Iraq.

I glanced at Hussain rushing off, venting his frustration at the passing floor. I turned to Mona, and we silently knew that we would be doctors.. or engineers!

In many ways, that was when our destiny was written, as every decision we made in school was to follow in the footsteps of Abbas and Hussain.

A few months later, Hussain went to Saudi Arabia to study Electrical Engineering, and Abbas went to Iraq to pursue his medical aspirations. Years later, Mona followed Abbas and became a doctor, and I followed Hussain to pursue Electrical Engineering in University of Basrah, Iraq.

Finding Balance

Balance is a word that resonates with me and a lesson I impart to anybody wishing to make a difference in this world. The balance between your family and your work, the balance between continuous education and self-actualization. On the road we call life, to maintain a balance, we must have the courage to lean on others for help.

My biggest test of balance came in 1983, a few years after graduation. I was newly married, had a 1-year-



The student Batool Abdul Aal with the students of the Electrical Engineering Department at the College of Engineering at the University of Basra in 1975

old beautiful son, and was selected as one of a few to obtain an advanced degree from the UK. This was an opportunity of a lifetime and unlikely to be given again. But it would take 9 months and countless classes away from home.

How could I leave my son alone and not be part of his early growth? Will I be able to focus knowing my family is 5000 km away?

Travel, at the time, was a huge deal, costly, and required a commitment. Long-distance calls were rare and expensive. It would be months of me occasionally hearing my husband's voice through a crackling international call.

Hard choices like this are among the most painful to make. But choices are a blessing, and when making them, we can aim to maintain a balance with the help of others. For me, it was my Mom. I owe her the fulfillment of my balance and the courage to take the risks I took.

"What is wrong, my love? What can I do to help?" She told me when I confronted her with my conundrum.

She has sacrificed a lot for us throughout the years. She was our rock, helped us study, organized our books, and cooked for us. Many years later, I realized that in many ways was fulfilling her dream through us, wanting us to achieve the things she couldn't and reach peaks that she couldn't.

"Go get the certificate! I will come with you and bring Ali with me and take watch over him while you study." She exclaimed. Little did I know, this began a continuous ritual of her taking care of Ali for many years while I pursued my career. To her, I owe the balance I sought, and to her, I owe my success.

Breaking Walls

I was always hands-on in everything I did, or perhaps, wanted to apply my engineering knowledge in the workplace at every turn.

I remember the coveted certificate, High Voltage Substation Operator, (33kv, or 66kv, or 220kv substations), where this license is granted to enable its owner to enter those main substations to check



Batool Abdul Aal with a number of classmates in a laboratory to conduct some electrical experiments at the College of Engineering, University of Basra in 1976.

them, operate the keys, and do the necessary work in emergency situations after official working hours, which I had my eyes on since I joined the Electricity and Water Authority in 1979.

It was a non-customary certificate for a woman at the time. Still, I craved the responsibility of operating an electrical substation that powered millions of lights and countless homes. The certificate was the official topic at many family dinners!

The day I approached my senior manager to apply as a High Voltage Operator, I had already read about it, learned the terms, and was prepared for the challenge.

"Batool, I don't think a high-voltage operator is a suitable job for a lady; it involves being called in at late hours" my manager claimed.

Why was this job not suitable for a Woman? The thing with racial stereotypes is that we tend to become victims of our own biases. As a woman, I think I had a fear that I might be judged for my decisions by others' expectations of what a woman should do, or shouldn't do.

Was I ok with being called at late hours, yes I was! Was I ok with the pressure and responsibility of being in charge of electrical substations, of course! What stabbed my confidence the most were others' expectations. What if I faltered as a Substation Operator, would they blame it on my predefined race? Or was it because I was not truly ready for it?

I will face many opportunities where toughness or roughness is a predetermined requirement and that, from a cultural lens, is not suitable for a Lady. I will face opportunities where grit or sweat of handling a male-dominated team presumes another Male would be more suited than a female.

Cultural biases tend to be pervasive, but also a wake-up call. Suddenly, I will have to work twice as hard or do twice as well in a given duty. As if to break the metaphoric boundaries of race. But it is also an opportunity to step into the unknown and pave a way where a new cultural norm is set.

For my strength in breaking cultural norms, I thank my husband, Jaffar. For allowing me to break the walls of expectations and reach for higher highs.



Eng. Batool Abdul Aal during conducting tests at power transmission stations in Bahrain.

“What do you mean you’re not suited?” he always claimed, “ there is no one who can do this job better than you.”

Responsibility:

The day finally arrived when I was put to the test, I received the first call for an emergency at a substation. I was one of a few certified substation operators on duty that night. It was 9 PM, and I was having dinner with my family. Jaffar gave me a reassuring look and a nod and started collecting the dishes. I put on my overalls with trembling hands; excitement mixed with fear coursed through me at the thought of what lay ahead. This was it, the moment of reckoning.

I reached the electrical site and walked towards the entrance of the substation in my electrical overalls and my operator tag gleaming in the moonlight. I placed my hand on the entry door and paused. For a moment, I had an overwhelming sensation of doubt and fear.

When faced with difficult tasks throughout life, self-

doubt often creeps in; however this time something inside me said ‘you can do this’ - which gave me the strength to carry forward despite overwhelming fear.

This newfound confidence reminded me of a lesson taught by my brother Hussain when I was 5. I did not know the impact of that lesson until much later in my life. He threw me into the deep end of a pool without warning.

“Hussain!! What are you doing!!?” I panicked as I was being flung into the water.

Although unorthodox at first glance his approach has proven invaluable over time as it instilled within me resilience and courage – two traits essential for success.

I thank Hussain for showing me that doubt is a good thing, and without it, there is no room for improvement, and a little fear helps bring focus to your actions. He has always paved my way toward education and knowledge and removed many obstacles ahead of me.

I took a deep breath, lifted my head high, and pushed



Eng. Batool Abdul Aal in the year 1982 during the scholarship year in the city of Manchester in a laboratory to learn how to conduct tests on underground electric cables.

forward to fulfill the responsibility I had always fought and craved for.

Fulfillment:

After 7 years had passed in the Electricity Transmission Department, where a job was announced in one of the departments, and I applied with a group of fellow engineers, and I was the only female engineer among the male applicants, and although I passed the interview successfully, I did not get the job, so I got upset and went to the official the concerned objected to the decision, so he justified me that this job and work in it requires going out to work sites in the sun and heat and difficult working conditions, and it is not suitable for women, but he promised to appoint me in another suitable position in another department.

Not getting that job prompted me to work harder and diligently, and after a while I was appointed to a job in the Department of Electricity Projects in the Strategic Planning Department for the main stations, a job that

requires meeting with consultants and contractors in the office more than going out to work sites.

A short while later, in 2003, I was appointed as the director of the department in which I was excluded from being appointed as a woman!!!, and instead of that job in which I would be responsible for 20 employees, I became in my new job (Directorate Manager) responsible for about 200 employees and more.

I listened to the decision to appoint me as a manager, on Bahrain TV. How beautiful is God's grace. He replaced me instead of the position of (Head of department) with the position of (Director) and at noon on the day I was preparing for the wedding of my son Ali, who traveled with me a baby to the UK!!!

One day in 2007, while I was in Beirut, the Chief Executive Officer, Dr. Abdul Majeed Al-Awadi, called me, and he asked me to come to his office immediately after my return, I was afraid of this call and request, tried to inquire about the reason in order to be reassured. He stressed the need to review it in his office after my return to Bahrain.

Get out of your Comfort Zone



Eng. Batool Abdul Aal during practical training in Manchester in 1982.

After I returned to work, I went to his office directly, and after salutations and greetings, he told me:

"I just wanted to let you know, you've got a promotion. Congratulations, Assistant Under-secretary for Electricity and Water Production and Transmission!"

I have been appointed as The Assistant Under-secretary for the Production and Transmission of Electricity and Water.

The thrill and excitement of the advertisement surged through my body. The weight of my whole process journey up to this point came to light, and I realized that this new job meant overseeing the same master plants I had searched and become an operator of 10 years ago, as well as the water production and transmission plants, now responsible for overseeing over 2,000 electricians and male-dominated production teams, and I realized that new cultural and social norms were being set based on competence and professionalism, and I had a front-row seat in that change.

Did I accept my promotion? of course! But for the next 7 years, I realized my true fulfillment lay elsewhere. The hardships and challenges in life bring resilience and growth, but my true fulfillment came from sharing my experiences with those facing the same challenges.

In the other aspect of my professional life related to charitable and voluntary work, upon my graduation in 1979, I joined the Bahrain Society of Engineers and the Bahrain Girl Renaissance Society, where I contributed in the field of women's empowerment and encouraging women to start their journey so that they have the courage to break the restrictions and find balance in this competitive world. After my retirement in 2014, my interest in women's development work increased through the Bahrain Girl Renaissance Association.

For my self-fulfillment, I thank the many women trailblazers. Who, despite doubts, fears, and cultural stigmas continue to pave their way to success.

Thank you for showing me that I am not alone.

Thank you for encouraging me to share my story so that we may, perchance, empower the next generation after us.

My Thanks to the editorial board of Almohandis magazine for encouraging me to share my story so that we may, perchance, empower the next generation after us.





The late, Amir, His Highness Shaikh Isa bin Salman Al Khalifa, may God rest his soul, hands Eng. Batool Abdul Aal a master's degree with distinction in 1990.

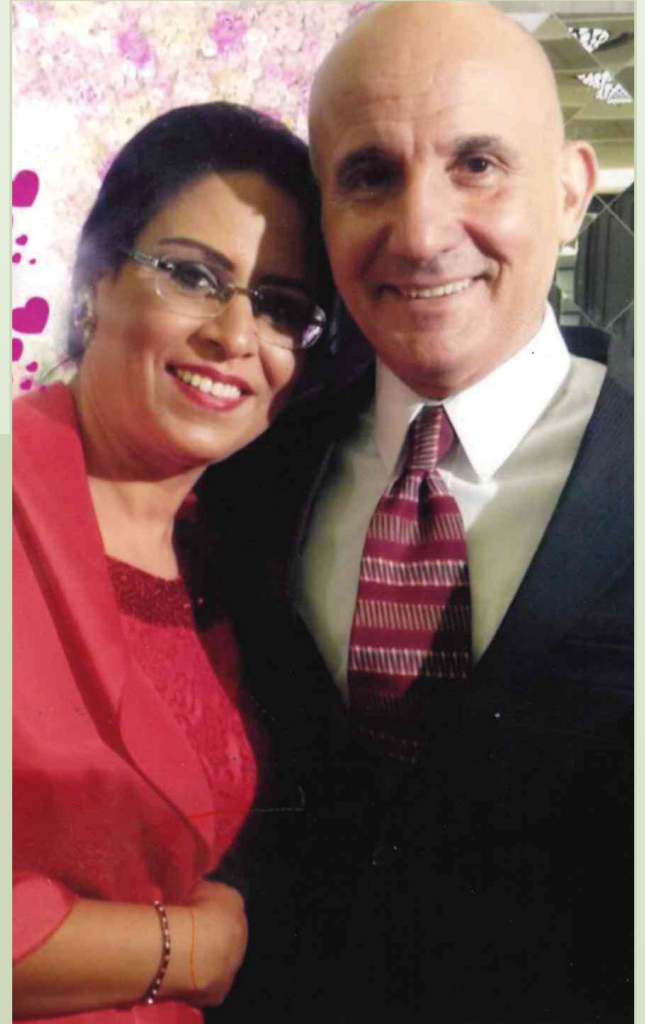
Eng. Batool Abdul Aal during a visit to officials from one of the financing banks for the projects of electricity transmission stations to see the progress of work.





Eng. Batool Abdul Aal with a group of employees of the Dictorate of Electricity Transmission during a visit to one of the power stations.

Eng. Batool Abdul Aal with her husband, the late Dr. Jaafar Tareef, and her young family, her sons, daughters, their spouses, and grandchildren.



Meedar Smart Aquaculture System

Medaar is a smart aquaculture system that acts as a platform for recording, monitoring, and controlling the fish tanks. It consists of a dashboard which monitors the oxygen and temperature of each fish tank using sensors which allows the system to control the water temperature levels in addition to the oxygen levels through automated valves. Moreover, it alerts the users using notifications sent to the devices and displayed on the interactive dashboard, as well as stores the readings in a secure database.

By maintaining the water quality of the tanks, the system aims to enhance the fish fingerling survival rate and maximizes the production levels of A multidisciplinary team consists of eight aspiring Bahraini youth, four engineers and four ICT, with six different majors.

Engineers:

- Ali Nabeel, Mechanical Engineer
- Maram Aljasim, Electronics Engineer (IoT)
- Zahra Alasfoor, Electronics Engineer (Microcontrollers)
- Zuhoor Busuhail, Electrical Engineer

Information and Communications Technology:

- Ghassan Alshajjar, Programmer
- Zahraa Alafoo, Programmer
- Husain Marhoon, Network
- Hamza Muhaiza, Network

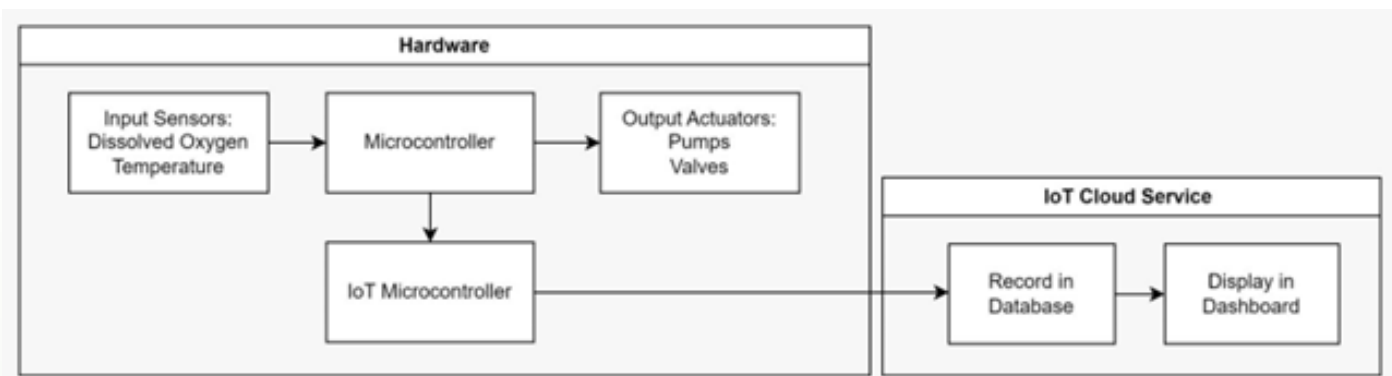


The Cloud innovation center at Bahrain Polytechnic collaborated with AWS to find a solution for the current problem at the ministry of municipalities and to be precise at the national mariculture center.

- The Mari Culture Centre hatcheries are home to more than 40 fish tanks.
- The tank holds around 80,000 to 100,000 fish fingerlings.
- The mortality rate among 30-day-old fish is approximately 90%.

The project aim is to enable and ease the process of monitoring and controlling the environment of the fingerlings to be within the optimum range." We wanted to create one box/unit that is scalable and can be placed in any tank, to monitor, control and automate. So, inspired by the control panels in the





instantly in case of any inconsistencies

3. Control

Control the equipment remotely and instantly through any registered device, available 24/7

4. Automate

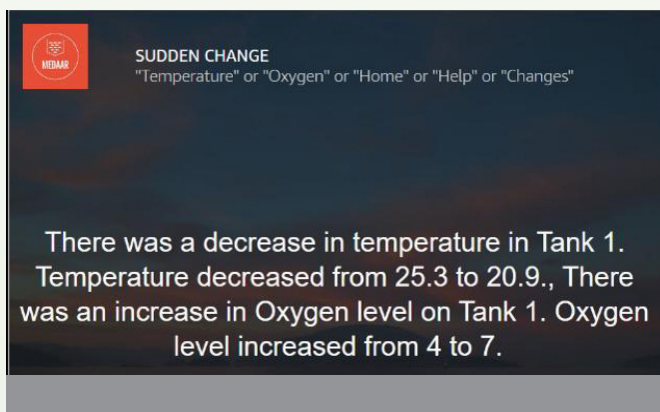
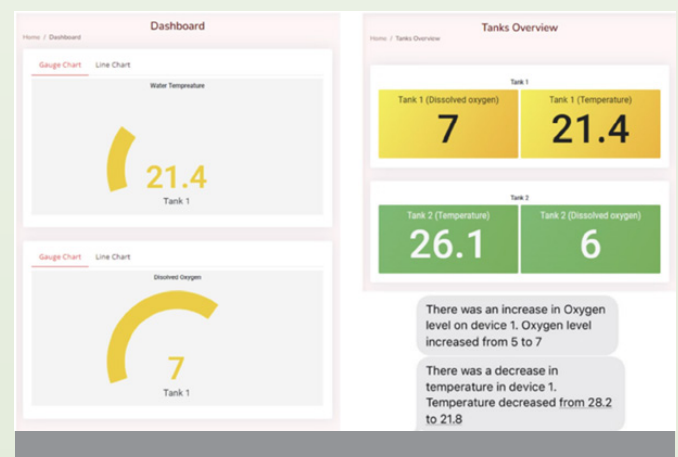
stem automation which uses smart and enhanced analytic tools to cut down on the manpower and reduce the reaction time for actions to be taken.

“ We had a lot of support from AWS, Bahrain Polytechnic and the tutors, which was great in providing theoretical knowledge. However, the main challenge is to establish a solution that entitles the main problem, and to integrate the whole system with the ICT team with minimum references. Furthermore, sourcing specific industrial material and components with minimum experience to create a prototype that simulates the pre-existing environment to prove the functionality of the solution Impact was also a challenge that was faced. ”

SDG

A. Decent Work and Economic Growth (8)

This project is entitled to aid the National Mari Culture in achieving its goal of maximizing the production



industries we came up with this solution to their problem. We have also considered the weather and humidity conditions in choosing the components and ensuring that everything is secure and safe ” said Ali. They implement a remote IoT-based monitoring system in addition to an automatic control system to ensure the water temperature is within 25°C to 30°C and Dissolved oxygen within 4 to 6 mg/L.

Process

1. Monitor

Minimize the potential risks through continuous monitoring and data streaming capabilities to any device

2. Notify

Allow for quick responses with the advanced notification system, which sends an alert to all registered devices

rate by up to 500% within the upcoming years. The National Mari Culture Centre established by the Ministry of Municipalities supplies the fingerlings to the Regional Commission for Fisheries and GCC countries.

B. Industry, Innovation and Infrastructure (9)

With the continuous rise in population, ensuring food security is one of the challenges that we are facing. Today engineering could provide an innovative solution to optimize aquaculture systems and enhance quality and productivity. With the aid of automotive control, we aim to develop the aquaculture industry via research and database.

C. Life Below Water (14) and Responsible Consumption and Production (12)

As the fish market in Bahrain is subjected to an increase due to the increase in demand. The aquaculture practice will provide the optimum environment for these species to populate. Especially for specific species that are targeted by the fishing market, it is essential to ensure that its desire in the market would not form pressure on the ecosystem.

Media

A Day in a Life of a Fish Hatchery Manager

To view the youtube media,

Please click here or scan QR code



ESG

A. Environmental

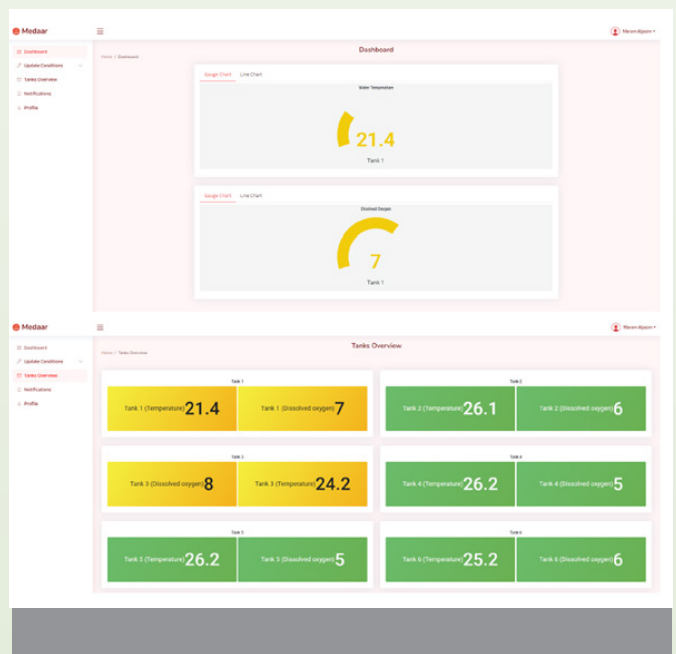
The environmental impact of the project targets resource scarcity and environmental compliance. As the fish market in Bahrain is subjected to an increase due to the high demand. The aquaculture practice will provide the optimum environment for these species to populate. Especially for specific species that are targeted by the fishing market, it is essential to ensure that high market demand would not form a pressure on the ecosystem or impact the environment negatively.

B. Social

The social impact is where we aim to provide an environment that respects human rights and security, with the evident increase in the Bahraini population, food security is essential. Furthermore, providing the fish in the market at prices that allows most of the population to afford. Moreover, balancing the workload on the employees working at the national mariculture center.

C. Governance

The governance impact targets risk management and ethics. Bahrain 2030 vision aims to shift the economy dependent on oil, to a globally competitive economy. The ability to embrace sustainability, With the aid of automatic systems in an aim to develop the aquaculture industry via research and database.



Design and Construction of a Cost-Effective Post-Tensioned Raft Foundation on Spatially Variable Ground Conditions in Bahrain

Eng. Hamzah Al-Hashemi

Eng. Qasim Alsaegh



Challenges:

The Once Mall project in Isa Town, Bahrain, is a significant commercial project expected to serve the whole educational area. During the conceptual stage, the soil laboratory conducted a soil investigation program, which indicated that the subsurface material encountered at the site was weak LIMESTONE layer, with a shallow groundwater level. Hence, the isolated footing option was designed for the project. However, when the excavation work for the footings started, the contractor found that 30% of the site area (i.e., around 3,000 sq.m) consists of silty SAND material up to 3m depth below the expected foundation

level. The consultant decided to revisit the foundation design, especially since the total induced loading of the structure is about 540 MN. The soil laboratory suggested either removing the whole soil layer and replacing it with a mass concrete filling or using piles. However, due to the significant cost impact of these recommended options, we have provided our assistance as a Geotechnical Engineering expert.

Solutions:

We requested additional soil tests to be conducted, including Plate Load Tests (PLT), and developed a 3D numerical finite element model (FEM) using Plaxis 3D to account for soil structure interaction (SSI) aspects.

1: Civil Engineering Department, College of Engineering, University of Bahrain, Isa Town 32038, Kingdom of Bahrain, & Geofem Ltd. Office 101, Andrea Zakou 2, Engomi, Nicosia 2404, Cyprus.

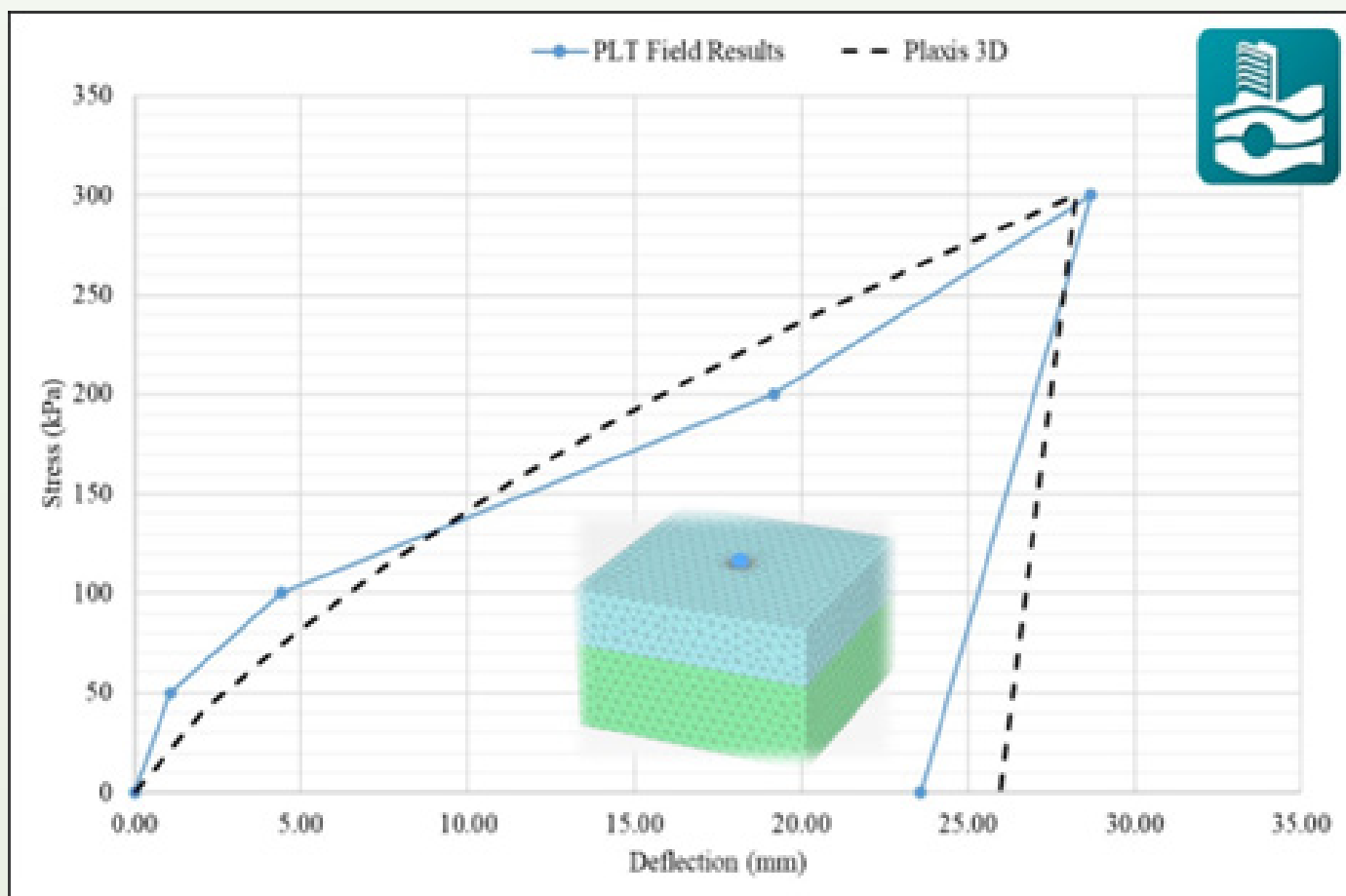
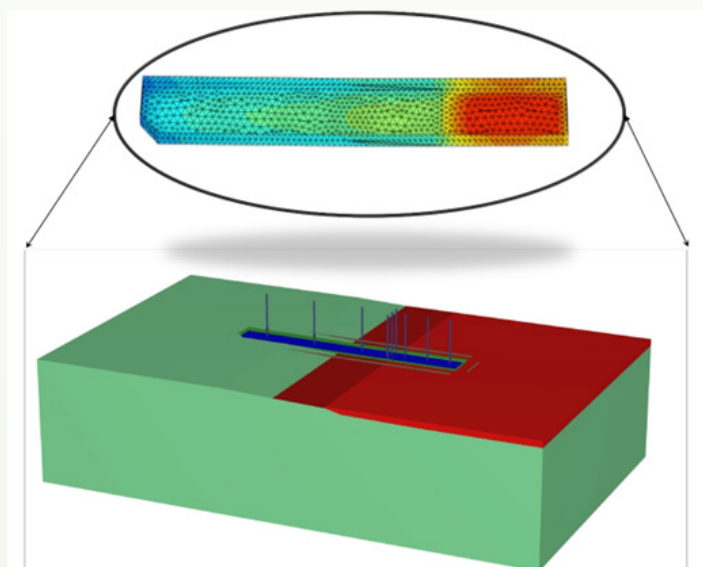
After calibration, the model provided accurate results compared to field measurements, as shown in the figure below. We have suggested and analyzed a standalone Raft (mat) foundation with an average thickness of ~ 400mm, which partially rested on the limestone rock layer and partially on the encountered silty sand layer. To optimize the raft foundation layout and value-engineer the concrete and steel quantities, the team adopted post-tensioning in the raft, a technique known since 1970 for foundations on problematic soils. The post-tensioning helped to reduce the concrete thickness, and steel reinforcement quantity, distribute the soil contact pressure underneath the raft more uniformly and, hence, reduce the differential settlement of the raft.

Benefits:

Unlike conventional manual design methods, we considered the actual raft geometry, spatially variable soil profile, groundwater level, actual column load distribution, and the excavation and construction sequence in the calibrated 3D FEM model. As shown below, the proposed PT Raft showed a maximum total settlement of 30mm, with an acceptable differential settlement, angular distortion, tilting, and adequate

safety factor that resulted from the shear strength reduction (SSR) safety analysis in the 3D FEM model.

The proposed PT raft option provided a cost- and time-effective solution to the client while satisfying the safety and code requirements, proving that the PT raft foundation is a viable option for spatially variable sites. The Once Mall project was successfully completed in 2022/2023, and the advanced 3D FEM model provided accurate and variable area spring (soil modulus of subgrade reactions) for the raft to be used in the structural model, which ranges from 3500 to



Getting industry closer to academia through industrial equipment



Case study: industrial emergency shut down

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University of Bahrain

In the last thirty years, safety of human, equipment and properties has become of prime importance in industry. Naturally, it is obvious to be taught at universities and colleges especially to instrumentation and control students. As mentioned in previous article (How can academia get closer to industry), here at the Chemical Engineering Department, an industrial DCS was acquired including an Emergency Shut Down System (ESD). The DCS currently has two main tasks. A normal operation where it is controlling the permeate flow rate and its conductivity and the cleaning process where a cleaning cycle takes over (will explained in a separate article). To maintain the system safe, an ESD based on YOKOGAWA PROSAFE is implemented. Project design and implementation are implemented on the SAFETY ENGINEERING STATION(SENG). SENG Prosafe software could also be installed on the same PC as CENTUM VP engineering station with different license. ESD task is developed using WORKBENCH PLATFORM. Workbench is a software used for all the safety project creations, system configurations, I/O module definition, Control Drawing, Logic Diagrams, Sequence Charts, Test Functions, Documentation, Database management and Parameter saving similar to that of a DCS but here the User Interface is different with more security levels added to ensure protection of the Safety Instrumented System. There are four input output modules used; an analog input module (SAI143 – 4-20mA), an analog output module (SAI533-H - 4-20mA), a digital input module (SDV144) and a digital output module (SDV531). The full configuration could be found in the PROSAFE manual. The ESD is programmed in LADDER diagram. The LADDER programming is excellent in programming sequencing, timing and counting. The software is launched through workbench platform in windows so a project

could be created. The Safety Control Station (SCS) is selected from the drop-down menu after installing the standard rack (SSC-50S Standard Type). The modules are then configured according to their position in the rack.

Node Configuration:

SCS Node Configuration Under the menu tree of each I/O card, Node number and Slot number are configured according to the hardware location. The node number has to be 1 for all I/O cards. Analog Input starts from the left which is in Slot 01. Similarly, all the other I/O cards Slots are configured (fig.2). Six external switches are wired to the Digital Input module whose variables are already defined (fig.3). Those switches are used to simulate fault in the process.

Signal Conditioning Circuit Design:

A signal conditioning circuit was designed to serve two purposes; one to boost the current because the current delivered by the SCS output channels is too small to drive the load and two to protect the SCS I/O module from any current or voltage surge. In case of emergency, the power is cut off to both the RO feed pump and the compressor motor. An overflow the relay is installed with a built-in diode but the second layer of protection for the Digital I/O module was desired. An output transistor (TIP31A) configured as buffer is used to isolate the SCS from the load. The transistor acts as a switch (fig.4). The output buffers drive two relays from OMRON, one switching on and off the power to the RO pump and the second switches on and off the power to the RO compressor as shown if fig.5.

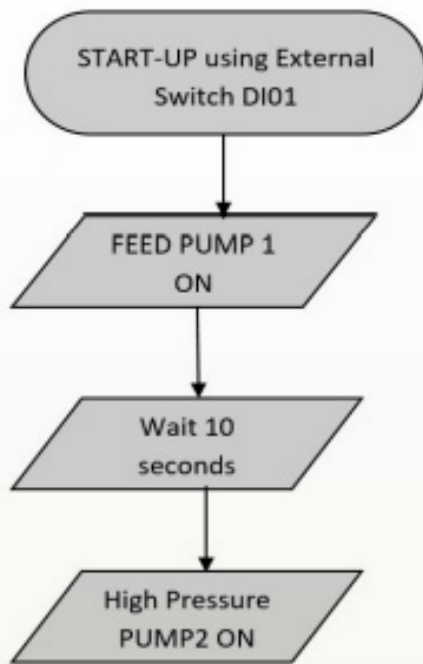


Chart1: Start up flow chart

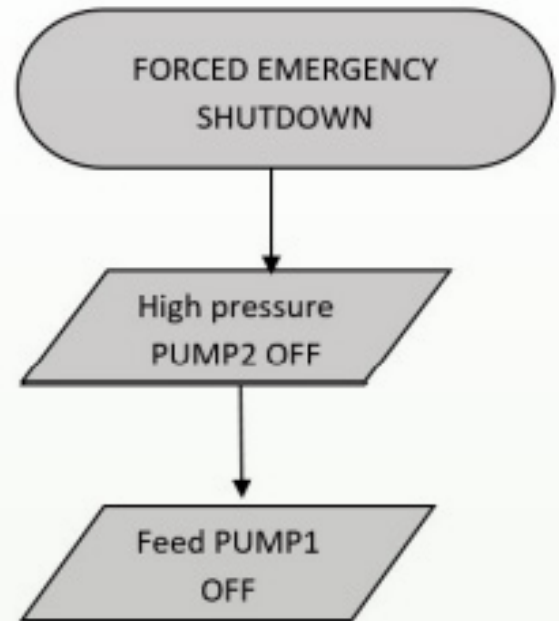


Chart2: Forced emergency shut down

LAD programming of Start-up & ESD:

Start-Up Sequence: During start-up, the feed pump is first switched ON, when the external switch DI01 is turned ON, to allow it to pump water from the Feed tank, through the filters to the inlet of the high pressure pump. The transport delay for the water to reach the inlet of the high-pressure pump is about 5 seconds. The high-pressure pump, if switched with a dry inlet, may get damaged. To avoid this damage, a time delay of 10 seconds was introduced when switching ON the high pressure pump 2 after the feed pump1. An external LED (DO01) is lit up and used as an indicator when the process is operating.

Forced Shutdown and Automatic Emergency Shutdown Sequence:

There can be two scenarios for shutdown: • Forced Emergency Shutdown • Automatic Emergency Shutdown Forced Emergency Shutdown: In case it is desired to shut down the process at any time during operation when the switch DI01 is turned off, the High-pressure PUMP1 is switched OFF then the Feed PUMP1 is switched OFF.

Automatic Emergency Shutdown (ESD):

Automatic Emergency Shutdown is automatically activated when the process exceeds the operating constraints. The process

will be automatically shutdown when the inlet pressure exceeds the HH limit value. An inlet pressure transmitter PT01 which is a shared sensor by the ESD and the FCS regulatory control is wired to the Analog Input module. The current value of the inlet pressure transmitter is compared to the HH limit using a block called LIMALARM in the SCS.

LAD Program Start-up & Shutdown:

To test the ESD system, a ladder diagram program was developed, tested using Debug Mode prior to implementation. In the above program, DO07 is the Feed PUMP1, DO08 is the High-Pressure PUMP2, DO01 is an external LED and the LIM ALARM is Alarm processing block which is input with the analog signal (AI03) from the inlet pressure transmitter.

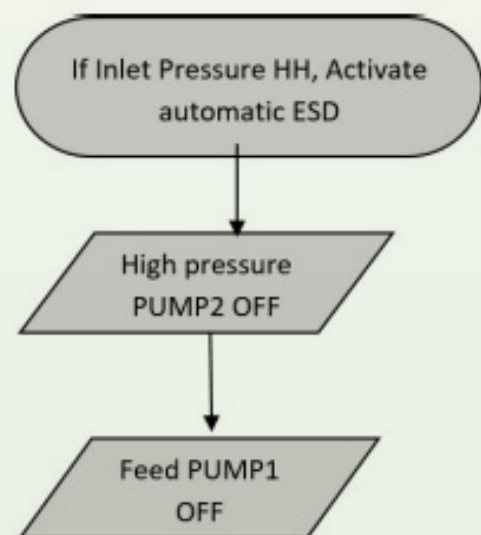
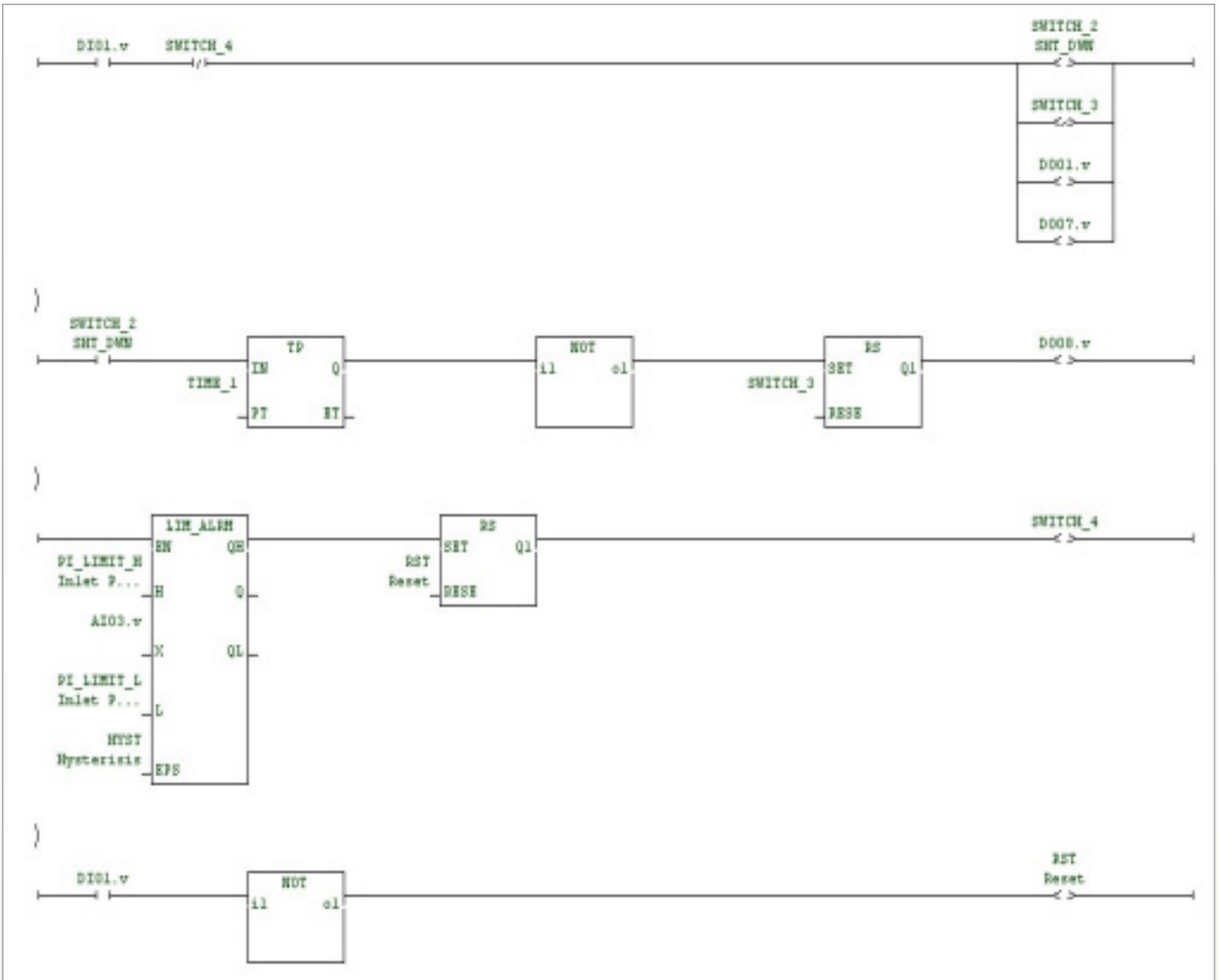


Chart3: Automatic ESD



LADDER program for ESD task

Automatic Emergency Shutdown: For Automatic Emergency Shutdown, a block called LIMALARM is used. The LIMALARM is input with the Inlet pressure measurement (AI03.v) real value. High and Low limits are defined using the Variable definition library. The LIMALARM compares the AI03 value to the PI_LIMIT_H and PI_LIMIT_L. The LIMALARM outputs a TRUE value at QH when the AI03 inlet pressure exceeds the PH_LIMIT_H High alarm. This output is used to set another flip-flop which is Reset dominant (RS) which is used to set an SWITCH_4, this ensures that the ALARM is latched. As soon as the SWITCH_4 is activated, it examines open contact becomes

FALSE forcing the system to follow the same sequence of the forced shutdown. The alarm will stay latched unless reset by the external switch. The variable RST is set when the external switch DI01 is OFF, thus unlatching the Inlet Pressure HH alarm and allowing StartUp again.

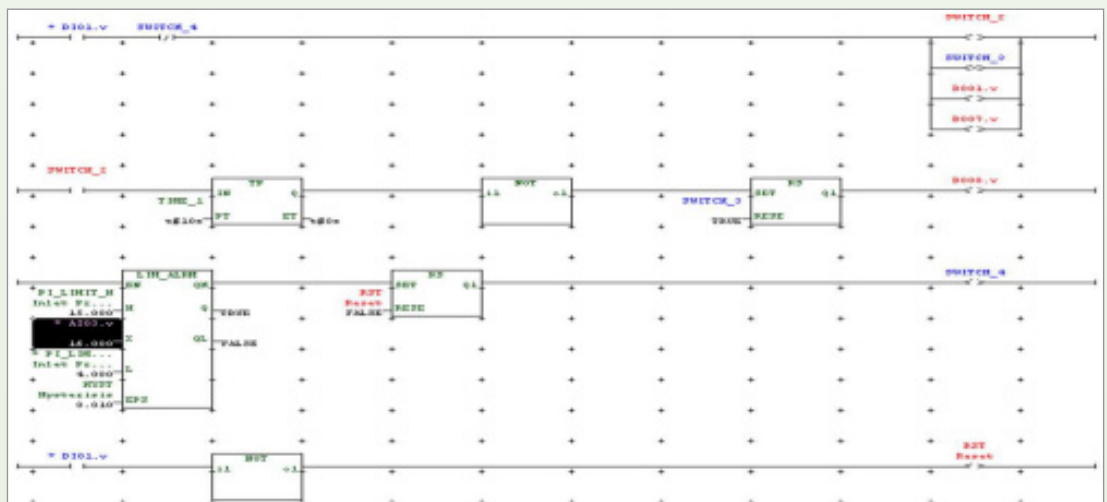




Fig.1:
 1- redundant power supplies 2- Central processing Unit (CPU)
 3- Analog input module 4- Analog output module
 5- Digital input module 6- Digital output module

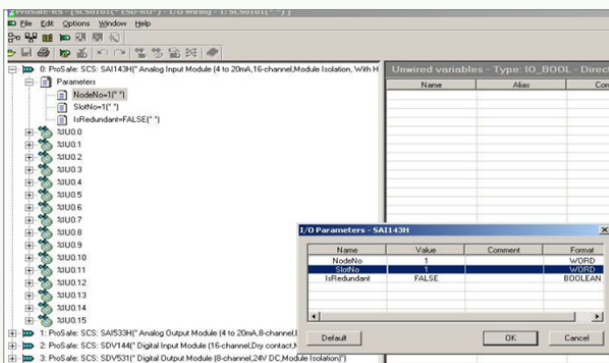


Fig.2: Safety instrumented system configuration



Fig.3: External emergency switches

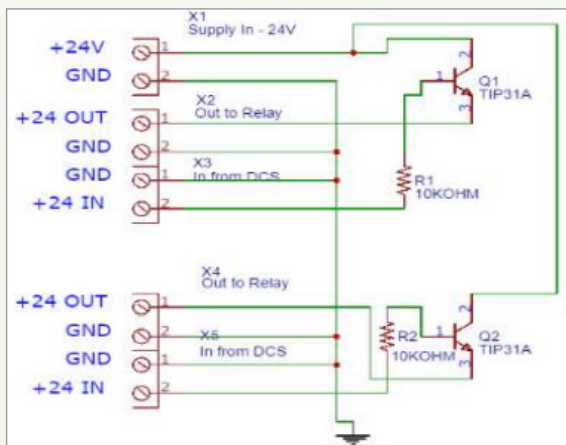


Fig.4: Relay drivers between the SCS and the load

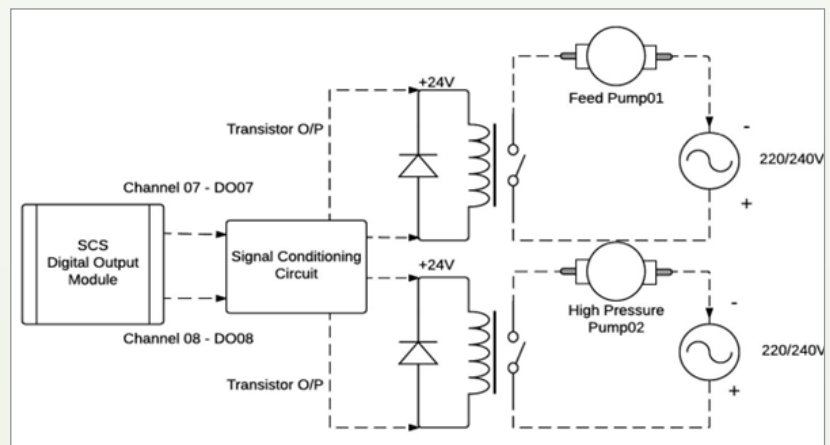


Fig.5: Interfacing the switching relays to the SCS

LADDER diagram for automatic start up debugging system

Conclusion:

Train the students on industrial equipment such as industrial ESD, industrial DCS, PLCs, RTUs, Industrial networks such as FOUNDATION FIELDBUS, PROFIBUS, MODBUS, DEVICENET just to name a few at universities and colleges is of vital importance for many reasons.

- 1- It closes the gap between academia and industry
- 2- It gives the required confidence to future engineers, so when they graduate, they will self-believe in executing the tasks assigned to them.
- 3- It helps reducing the training duration considerably.
- 4- It helps academia to understand the link with industry better.
- 5- It may contribute to building links between the two parties in terms of research and development.

Real Estate Market Index for the Kingdom of Bahrain



Eng. Ebrahim Ali Al Burshaid
Chief of Real Estate Information and Studies (Acting)
Head of Real Estate Information
Real Estate Regulatory Authority (RERA)



The Bahrain real estate market is on the rise, offering endless opportunities for investors.

Developing the real estate market index

In Bahrain, the real estate market is growing and becoming more developed. This is good news for investors, house owners, and other interested parties. The increased development means that there are more opportunities for investment and growth. Now is a good time to do so for those looking to purchase a property in Bahrain. There are many options available on the market, and prices are reasonable. Bahrain is an excellent option to consider if you are considering investing in real estate. With a growing economy and an increasing number of developments taking place, it is a market that offers potential for growth.

The definition of a real estate market index and what it measures

Understanding the real estate market can be challenging and confusing, but measuring its performance can be even more difficult. A real estate market index is a tool that provides such a metric, reflecting the average performance of a basket of representative real estate assets over time. This lets investors get an overall picture of the industry's performance and make informed decisions based on data-driven insights rather than intuition or speculation. With these metrics, they can develop reliable strategies for success in the ever-changing real estate industry.



Factors that influence the real estate market

How the index is used as an overview of the real estate market

The real estate index is invaluable for keeping an eye on the housing market's health. It takes into account a wide variety of data points, from changes in property values to employment and population growth, giving users a tangible representation of how the real estate market is performing. By tracking the performance of sample real estate assets over time, this index paints a detailed picture of short-term and long-term trends so investors and business owners can make informed decisions when considering purchasing or renting new properties. Knowing these numbers helps individuals weigh the pros and cons of investments in any location compared to other areas where they could be more successful. An index is an essential tool for staying up-to-date on ever-changing housing conditions.

What the index covers in terms of representative real estate assets

A real estate index is an incredibly useful tool for investors, as it provides a comprehensive overview of the state of the market in regard to a variety of real estate assets. The index covers traditional residential properties and commercial properties such as office buildings and industrial sites. In addition, the index accounts for other types of non-residential real estate investments, such as hotels and special leaseholds. The real estate index offers investors valuable insight into their overall portfolio performance by tracking these various asset classes.

The time frame that the index covers

A real estate index provides a comprehensive snapshot of the current state of a range of real estate assets, serving as an informative source of data for investors and analysts alike. However, what one needs to pay specific attention to when

analyzing the index are the time frames it covers. Generally, a real estate index can cover several months, quarters, or even years, and each time frame will offer unique and insightful insights into the real estate market. With this information, investors are better equipped to make informed decisions about which markets they want to invest in and which asset types will offer the best potential returns during that timeframe. Ultimately, being aware of the time frame covered by a particular real estate index is a crucial step toward making well-informed investment decisions.

Developing a real estate index

Developing a real estate index requires a systematic approach and a robust methodology. Here are the steps involved in developing a real estate index:

1. Determine the purpose and scope of the index: The first step in developing a real estate index is to determine what the index will be used for and what types of properties it will cover. For example, will it cover residential properties only, or will it also cover commercial properties? Will it cover a specific region or the entire country?
2. Select the properties to be included in the index: Once the purpose and scope of the index have been determined, the next



The evolving real estate index market: a gateway to new investment horizons.



Embrace the growth and potential of the developing real estate index market for a prosperous investment journey.

step is to select the properties that will be included in the index. The properties should be representative of the market and should be selected based on factors such as location, size, and type of property.

3. Collect data on the properties: The next step is to collect data on the properties that will be included in the index. This data should include information on prices or rents and should be collected from reliable sources such as government agencies, real estate agents, and property managers.

4. Develop the methodology: The next step is to develop the methodology for calculating the index. This may include defining the weighting scheme for the properties, determining how changes in prices or rents will be reflected in the index, and defining the base period for the index.

5. Calculate the index: Once the methodology has been developed, the next step is calculating the index. This involves applying the methodology to the data collected on the properties to obtain a numerical value for the index.

6. Validate the index: The final step is to validate the index to ensure that it provides a reliable and accurate reflection of the real estate market. This may involve reviewing the methodology, making any necessary adjustments, and checking the results against other data sources.

It's essential to have a robust methodology and to ensure that the data used in the index is reliable and accurate. A well-designed real estate index can provide valuable information on market

trends and can help inform investment decisions. However, seeking professional advice and conducting thorough research is recommended before making any investment decisions.

The benefits of having a real estate market index

Utilizing a real estate market index is an excellent way to gain insight into the overall performance of the real estate industry. The index helps create a comprehensive view of how different markets, regions, and asset types are trending in value, allowing individuals and businesses to better plan for their investments. Tracking the index over time makes it possible to confer whether certain real estate markets are increasing or decreasing in value, giving a competitive edge to investors focused on maximum return rates. An index also allows people to better assess the risk associated with any particular investment by understanding exactly what the current market trends reflect. Overall, having access to an up-to-date real estate market index is an invaluable tool that can help guide smarter decisions while promoting better ROI potential.

A real estate index is a valuable tool for measuring the average performance of representative real estate assets over time. The index provides an overview of the real estate market, covering various asset types and investment options. The benefits of having a real estate market index include: a better understanding of risk and return characteristics, more informed decision-making, and improved portfolio management.

Planting Mangrove Trees in the Kingdom: Sustainable Solution Against Climate Change



Dr. S. M. Zakir Hossain
Dept. of Chemical Engineering,
University of Bahrain

1. Introduction:

Mangroves are trees and shrubs generally living in coastal areas. They are categorized into around 80 species with different ranges in height up to 40 meters above the water. Some mangroves live near the shoreline and are flooded with salt water daily. Notably, Mangroves have a fantastic ability to eliminate CO₂ faster from the atmosphere. Scientific reports indicate that mangrove forests sequester carbon much quicker and longer than other tropical land forests. Mangroves can store up to 5 times more carbon than other trees. Saudi Aramco determines a mangrove tree (*Avicennia marina*) sequesters up to 1.5 metric tons of carbon over its average 60-year lifetime. Mangrove forests can offer nature-based ecosystems by providing life-sustaining habitats for plants, birds, and fishes with food security and well-being. The branching root system underwater builds a haven for many fishes, especially those easily preyed upon young. The complex and deep descending roots inhibit shoreline erosion from tides and heavy storm surges, granting adjustment to climate change effects.

2. Planting Mangroves:

The GCC countries, especially the Kingdom of Saudi Arabia and Bahrain, have taken programs separately for planting mangroves in their regions. The program aims to defend against desertification, mitigate climate change, and

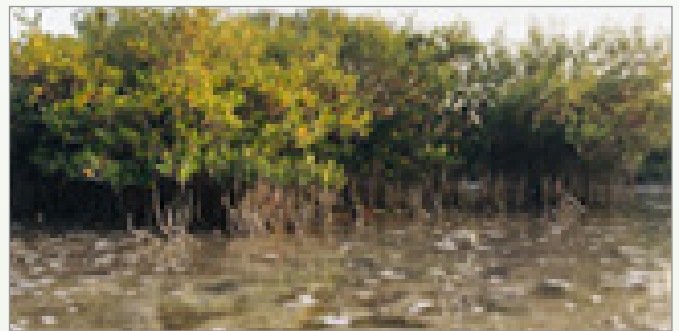


Fig 1. Mangrove trees in Bahrain



Fig 2. Cone like roots, help the tree gain access to oxygen even when the roots are submerged.

retain and enhance livelihoods. Ecological imbalance occurs by deforestation, which is an assault on nature. With the line up with their "Vision 2030 transformational program", both Kingdoms have triggered multiple tree-planting programs in different locations, especially coastal areas, mountains, and deserts. Both countries signed the United Nations Convention fighting against desertification and climate change. The aim is to reach the "Sustainable Development Goals" implemented by all United Nations members to safeguard the earth and prevent the extinction of poverty by 2030. The Kingdom of Saudi Arabia implemented mangroves alongside the shores of the Arabian Gulf. Saudi Aramco has planted over 4.3 million mangroves at the Arabian Gulf and Red Sea coasts, with support from other companies and volunteers. Another 2 million mangrove seedlings are currently being planted in Yanbu as part of its ongoing commitment toward the mitigation of climate change. The first mangrove eco-park in the Kingdom, protecting 64 km² of marine habitats, has been completed recently. In the Kingdom of Bahrain, Mangrove forests are located in Ras Sanad, in the southern part of Tubli Bay, an inshore coastal area in the northeast region (see Fig 1). Arad Bay is another important coastal mangrove reserve in the Kingdom of Bahrain. The mangrove trees have been planted

thoughtfully to enhance the soil's cohesion and provide a safe house for many fishes. Millions of tiny micro-organisms that are important for the marine environment live in the sands of this protected marine sanctuary.

3. Adaptation ability:

Mangroves have evolved into particular adaptations that enable them to live in low-oxygen, high-saline coastal environments. They have impressive adaptations characteristics against hot, muddy, and salty conditions. With the highly branched roots submerged in water, mangroves hold themselves upright in the shifting sediments where land and water meet. The roots also can keep out most of the salt via filtration. The soil of coastal areas is usually severely lacking O₂; thus, they face another challenge for survival. Most plants can easily consume O₂ from gases trapped within the surrounding soil, but this is not an option for mangrove roots, and they need access to air. Mangrove roots are flooded with water up to 2 times a day. This exceptional condition authorized the evolution of unique structures (e.g., cone-like roots) that facilitate the roots' access to the atmosphere (see Fig 2).

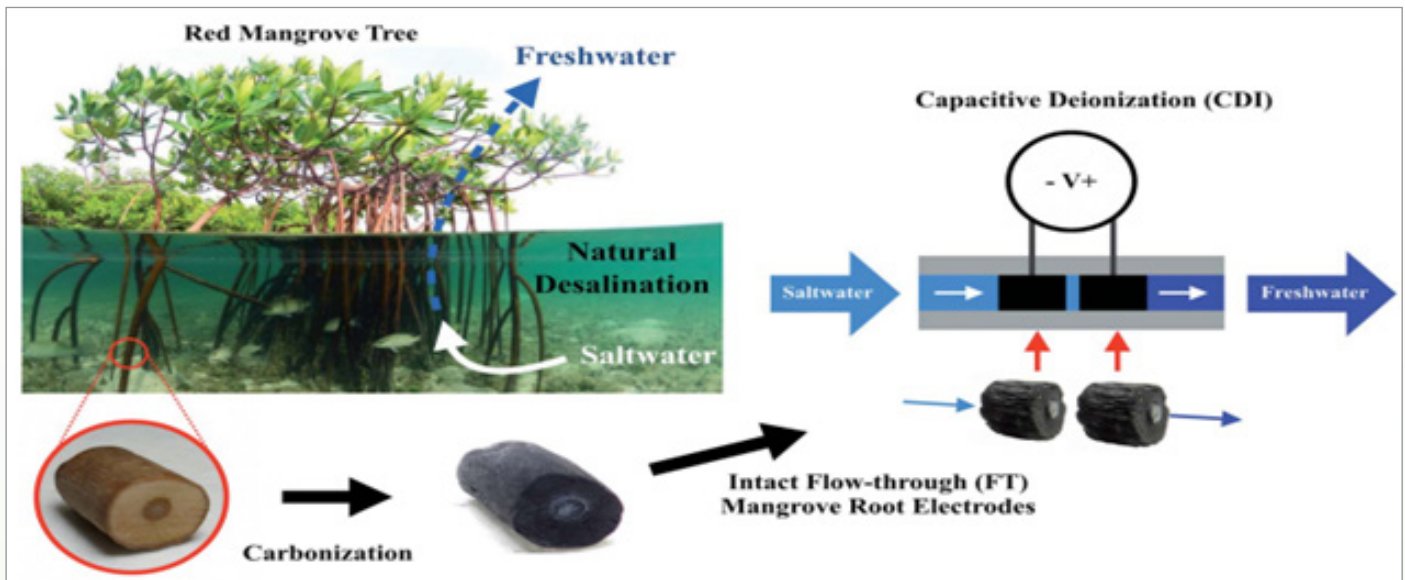


Fig 3. Mangrove electrodes are used for water purification via desalination [3].

4. Merits of planting Mangroves:

Carbon sequestration: Mangrove trees are highly efficient at carbon sequestration. They protect the climate by absorbing CO₂ and mitigating greenhouse gases from the surroundings. Trees convert CO₂ into plant matter via photosynthesis. Researchers have shown that Mangrove forests «sequester carbon at a rate 2-4 times higher than tropical forests and hold the highest carbon density» [1].

Good energy source: Mangroves are high carbon content biomass in their stems, roots, and leaves, making them suitable for many valuable products. They are beneficial for charcoal and pole production. Mangrove wood has a significantly higher calorific value, between 17.23 MJ/kg to 19.21 MJ/kg, compared to other woods [2]. The high fixed carbon content makes this wood produce more solid fuels. Mangrove wood has a high content of volatile matter, indicating it can be suitable for biofuel production.

Valuable products: Mangrove wood particles can be utilized as reinforcing agents in polymer composites owing to their merits over fossil-derived artificial fibers, including carbon, glass, and aramid. Some valuable effects of natural fibers over synthetic

fibers include minimized cost, biodegradability, low density, recyclability, non-abrasiveness of equipment, non-irritant to the skin, low energy consumption, less emission of toxic fumes, and renewability. Mangrove leaf powder acts as a potential adsorbent for heavy metals as well as wastewater treatment. Intact mangrove root acts as electrodes for desalination and produces freshwater (see Fig 3).

5. Conclusions:

Mangrove trees affect humans by making their houses, and forming dense barriers against tsunamis and storms, thus protecting lives and saving property. Mangroves help to stabilize shores by trapping sediments and soils. They also help to increase water quality by filtering polluted waters. Mangroves intake massive amounts of CO₂ from the atmosphere; thus, they are sometimes called the "natural sink for CO₂". They can survive in harsh environments and are an essential nature-based solution to mitigating climate change. Scientists approximate that the world's mangrove forests provide billions of dollars worth of services for human communities.

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The Growth of Electric Vehicles (EVs)

Dr. Osama Yaseen Al-Rawi

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It's simple for a buyer to think that electric cars are a recent invention. After all, they've only recently begun to become more well-known. You might be surprised to discover that the United States' first electric car first drove on a public road in 1890. However, William Morrison's electric car only had a top speed of 14 miles per hour, but it ignited interest in EVs across America. Gas-powered and electric vehicles engaged in fierce market share competition for a period. Yet once Henry Ford unveiled the Model T in 1908, the trend shifted in favor of gas-powered vehicles, which became even more accessible.

Since the Toyota Prius was introduced in 1997, electric car interest has increased significantly. With the introduction of the first hybrid electric vehicle for mass production, interest in contemporary electric vehicles began to grow. EVs have substantially improved since the Prius hit the market in order to compete with the gasoline-powered vehicles that are the current industry norm. EVs are now more affordable to operate than they once were. Additionally, EVs can now travel farther on a single charge thanks to advances in technology, but compared to gasoline-powered cars, EVs typically have a shorter driving range. For instance, the majority of EVs have a range of at least 100 miles per charge. While some can go over 200 or 300 miles on a single charge, they are typically less flexible than a gas-powered choice.

We buy for horsepower, but we drive for torque, according to the U.S. Department of Energy, which claims that electric motors produce a smoother ride with greater acceleration.

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MIEEE, MIET-UK, FHEA-UK, MISDS- Japan
Dean of College of Engineering

EVs have a lot of torque and speedy acceleration. Additionally, compared to owners of gas-powered vehicles, EV owners have fewer maintenance obligations. The market for electric cars (EVs) has expanded quickly in recent years and is anticipated to do so throughout the course of the next ten years. Electric vehicle sales in the US rose from just 0.2% of all car sales in 2011 to 4.6% in 2021 (see chart 1). More consumers are making the transition as automakers develop more affordable ways for EVs to travel long distances. EV sales made up 5.6% of the entire vehicle market as of the second quarter of 2022. This is an increase from 2.7% in the second quarter of 2021.

Therefore, Electric vehicles (EVs) have been growing in popularity



in recent years due to their numerous advantages over traditional gasoline-powered vehicles. EVs are powered by electricity from rechargeable batteries, which makes them more environmentally friendly and energy-efficient compared to gasoline-powered vehicles that rely on fossil fuels. Here are some key factors contributing to the growth of EVs:

1. Government incentives: Many governments around the world offer incentives to encourage EV adoption, such as tax credits, rebates, and subsidies. These incentives help to reduce the cost of EVs, making them more accessible to consumers.

2. Improving technology: Advances in battery technology have led to longer driving ranges and faster charging times, making EVs more practical for daily use. In addition, the development of charging infrastructure has made it easier and more convenient for EV owners to recharge their vehicles.

3. Environmental concerns: Climate change and air pollution have become major issues in recent years, and many consumers are opting for EVs to reduce their carbon footprint and improve air quality.

4. Lower operating costs: EVs are generally cheaper to operate than gasoline-powered vehicles, as electricity is typically less expensive than gasoline. In addition, EVs have fewer moving parts than traditional vehicles, which means lower maintenance costs.

5. Public perception: As more people become familiar with EVs and their benefits, the perception of EVs as a viable alternative to gasoline-powered vehicles is improving. This is leading to increased consumer interest and adoption of EVs.

6. Increased availability: as more automakers enter the EV market, there is a wider range of electric vehicle models available to consumers at different price points. This has made EVs more accessible to a wider range of consumers.

7. Corporate sustainability initiatives: Many corporations have made commitments to

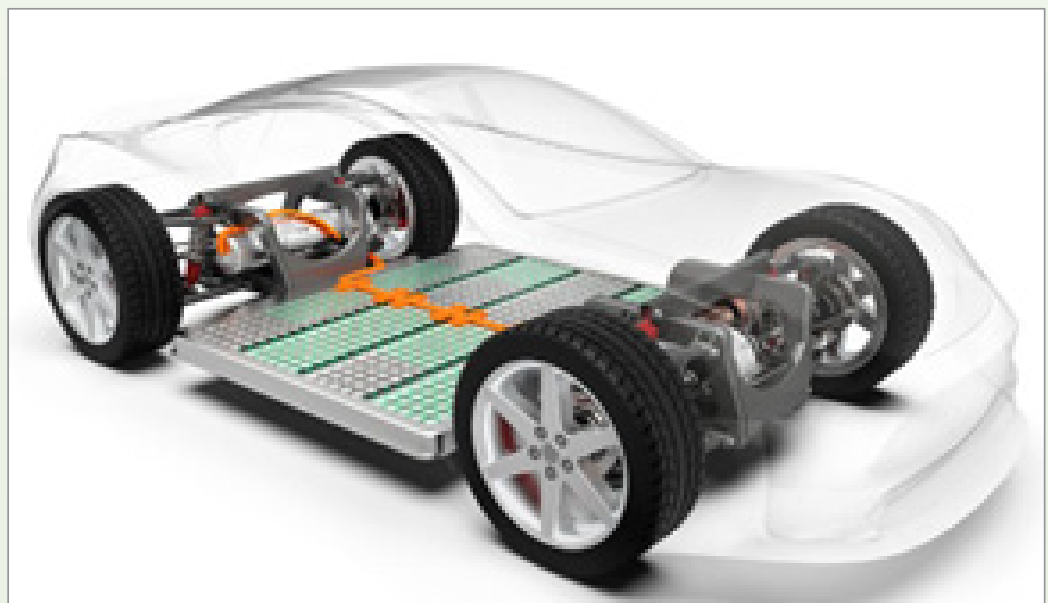
reduce their carbon footprint and are encouraging employees to use EVs or provide charging infrastructure at their workplaces.

8. Urbanization: As more people move to cities, the demand for cleaner, more efficient transportation options has increased. Electric vehicles are well-suited to urban environments, where they can reduce air pollution and noise.

9. Global regulations: Many countries around the world have set targets to reduce greenhouse gas emissions, and some have announced plans to phase out the sale of gasoline-powered vehicles altogether. This is expected to drive further growth in the EV market.

10. Innovation in the EV ecosystem: Beyond just the vehicles themselves, there is significant innovation happening across the entire EV ecosystem, from charging infrastructure to battery recycling. These innovations are improving the overall user experience and making EVs more practical for everyday use.

Overall, the growth of EVs is expected to continue as technology continues to improve and governments and consumers become more committed to reducing their carbon footprint and addressing environmental concerns. In summary, the growth of electric vehicles is being driven by a wide range of factors, including government incentives, improving technology, environmental concerns, lower operating costs, public perception, increased availability, corporate sustainability initiatives, urbanization, global regulations, and innovation in the EV ecosystem. As a result, the market for electric vehicles is expected to continue to grow rapidly in the coming years.



DESIGN OF INFRASTRUCTURE DRAINAGE SYSTEM FOR EAST HIDD

Project Team:

- Abdulrahman Al-Thawadi
- Qasim Alsaegh
- Ali Husain Mohammed
- Abdulla Jaliluddin Shaikh

Supervisor:

Dr. Jalal Al-Thawadi



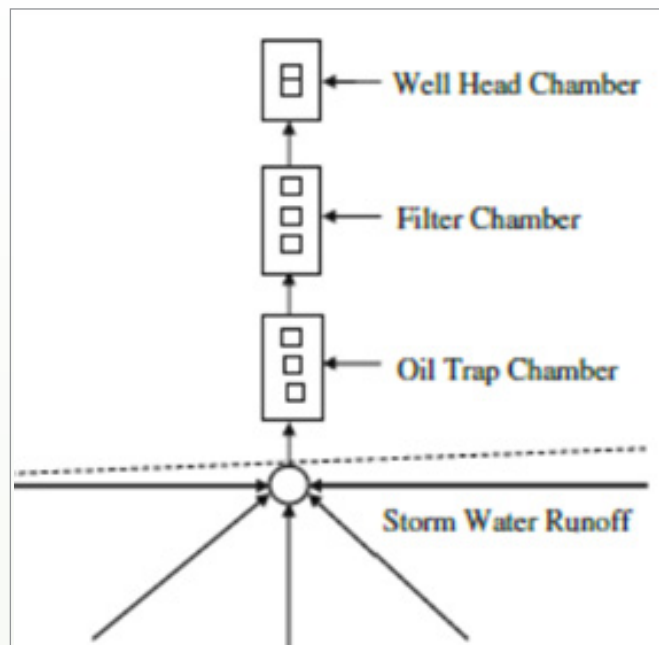
The development of urban infrastructure has been a critical task for governments worldwide, and the Kingdom of Bahrain is no exception. With the growing population and increasing urbanization, it is necessary to develop infrastructure that is sustainable, efficient, and resilient to withstand the impact of climate change.

The construction of East Hidd City by the Ministry of Housing aimed to provide practical, affordable infrastructure for its residents. However, design mistakes led to the roads being

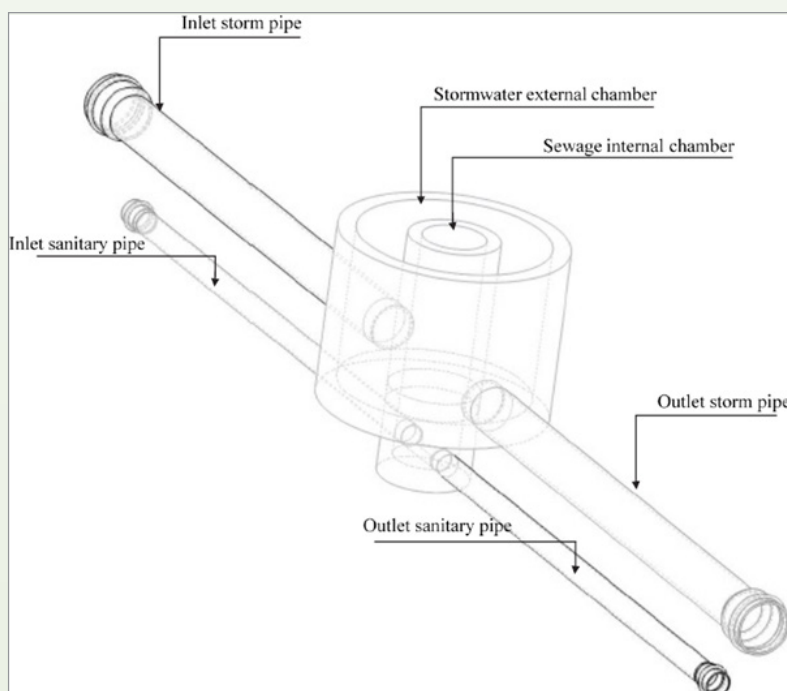
built at a higher level than the houses, causing damage and losses during storms. To address this issue, a new drainage network was required. The design of this system required an indepth analysis of hydrological elements such as runoff and infiltration, as well as basic hydraulic principles. This is because the primary function of a drainage system is to collect and convey stormwater runoff safely and efficiently, preventing flooding and erosion. Therefore, engineers Qasim Alsaegh and Abdulrahman Al-Thawadi considered

various factors such as topography, soil type, land use, and rainfall patterns while designing the drainage system. To ensure the effectiveness and suitability of the drainage system, a unit hydrograph was utilized. A unit hydrograph shows the difference in flow or discharge per unit of runoff over time, making it an essential method for forecasting how precipitation would affect streamflow. By using this method, engineers Qasim Alsaegh and Abdulrahman Al-Thawadi accomplished a drainage system design that could carry and handle a large amount of discharged rainwater over a 50-year period.

The drainage system designed for East Hidd City has the capacity to handle and convey a large amount of rainwater discharged during storms, ensuring that the residents are safe and their properties are protected. However, engineers Qasim Alsaegh and Abdulrahman Al-Thawadi employed the collected rainwater volume for the benefit of the community and the environment. Three scenarios have been proposed to benefit from the collected rainfall volume, which is an unconventional approach to follow in urbanized residential cities in Bahrain. The first scenario focuses on utilizing stored water for irrigation, which could help reduce the demand for freshwater and reduce the energy consumption needed to produce it. The second scenario involves artificial groundwater recharge (stormwater injection), which could help replenish the aquifers and increase the water supply. The third scenario involves the treatment of rainwater for human use through filtering and reuse, which could help reduce the demand for freshwater and the discharge of wastewater. These scenarios contribute to the environment and society by providing small amounts of flow that can be used to benefit the community. Utilizing the collected rainwater volume can help reduce the demand for freshwater, conserve energy, and promote sustainable water management practices. Moreover, it can help increase the resilience of the community to the impact of climate change, which is becoming increasingly important in today's world.



In conclusion, the design of a sustainable and efficient drainage system is essential for urban infrastructure development, especially in areas prone to flooding and erosion. The use of advanced scientific methods such as the unit hydrograph aided engineers Qasim Alsaegh and Abdulrahman Al-Thawadi to design a drainage system that can handle large amounts of rainwater and prevent damage and losses during storms. Moreover, the unconventional approach of utilizing the collected rainwater volume can provide additional benefits to the community and the environment, promoting sustainable water management practices and increasing the resilience of the community to the impact of climate change.



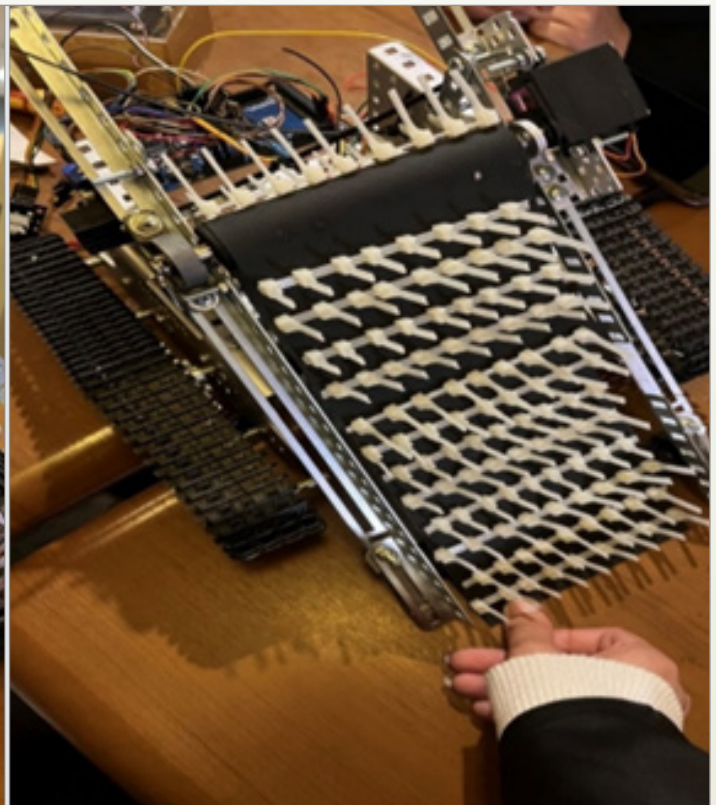
DESIGN OF BEACH CLEANING ROBOT (BEBOT)

Project Team:

- Fatima Abdulla Alkaabi
- Almaha Hamad Alammari
- Rama Mohamed Alkaraki

Supervisor:

Dr. Salwa Saleh Baserrah

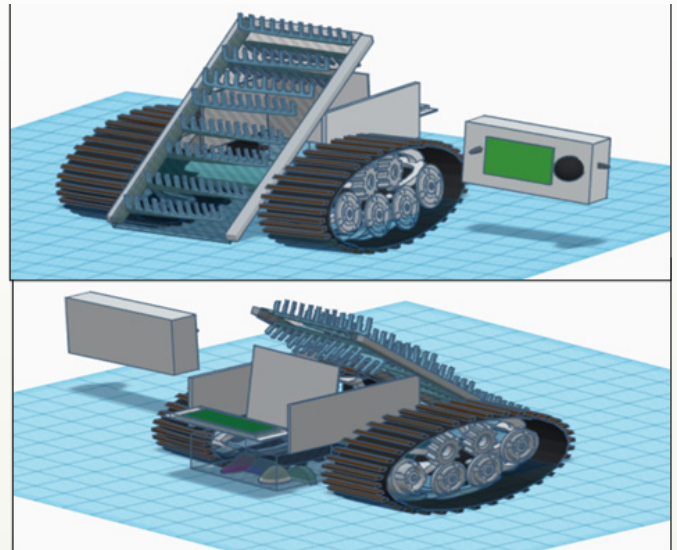


The amount of dirt accumulating along beaches around the world has resulted in air, land, and water pollution, and the world is currently facing a significant challenge. As a result, this seemingly basic problem may be the root cause of a slew of other environmental issues. The pollution created by this problem can cause the ozone layer to expand, resulting in global warming. Pollution problems are like a chain reaction: when one environmental problem begins, it causes another. For all these reasons, it is decided to design a robot that needed no human effort at all to clean the beach that is called Beach Cleaning Robot (BeBot). This robot is simple to use and works on all beaches. This is considered as an eco-friendly solution that cleans the beach without the use of human hands. Furthermore, this approach saves workers from the lengthy and exhausting hours of manual beach cleanup.

The brain of the BeBot operation is Arduino and it is equipped with different sensors, such as humidity, temperature, and

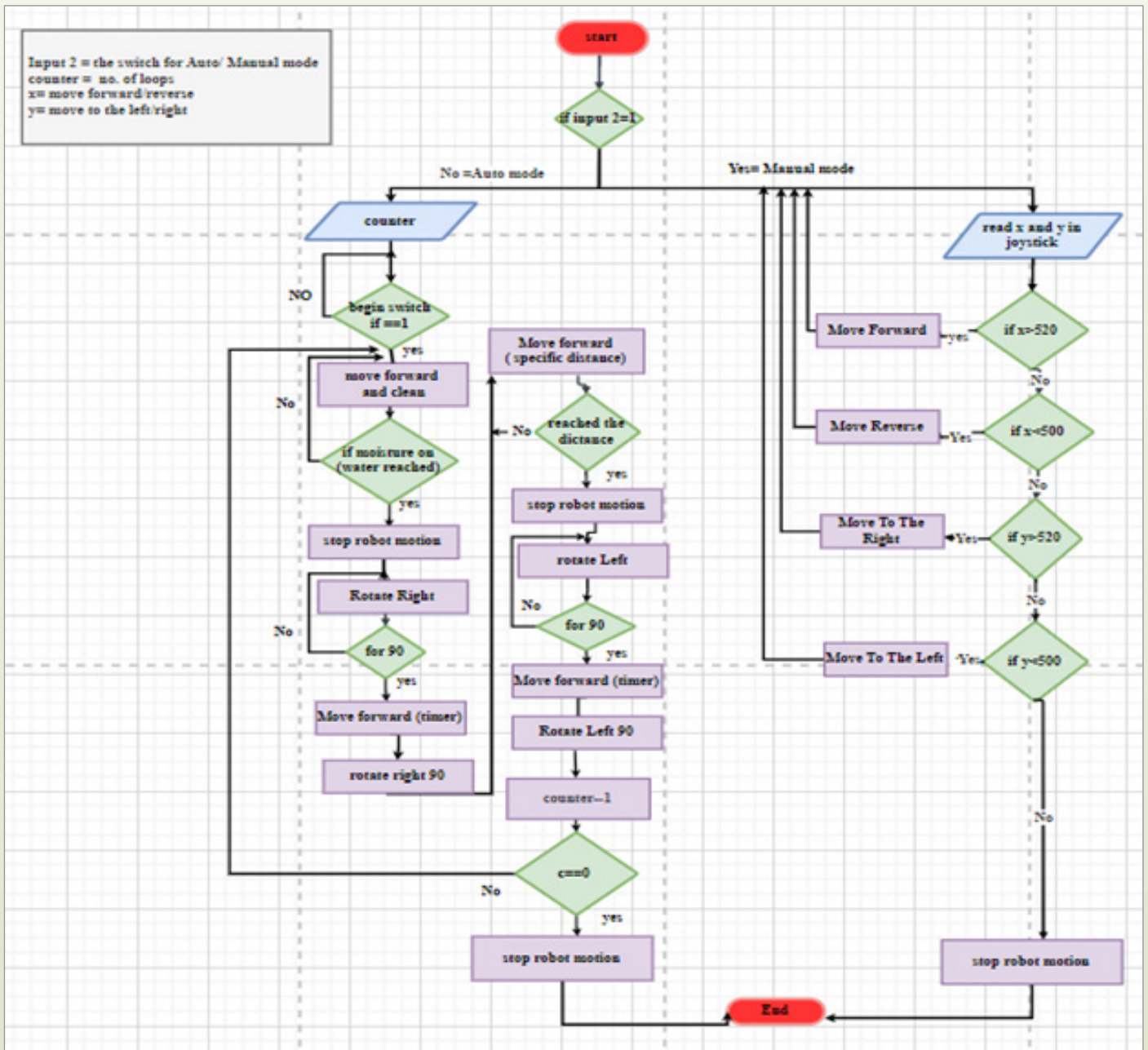
compass sensors. BeBot is programmed to work in two modes of operation: automated and manual. In automatic mode, BeBot will go to the shore in four phases along a predetermined course. However, the user must first determine the number of loops based on the area to be cleaned using the toggle switch, after which the BeBot will begin with the first stage, where it will continue to move forward towards the shore until the humidity sensor turns ON, indicating that it is very close to the sea, at which point it will stop and turn to the right. Then, in the second stage, it will move forward slightly at a specific time, then rotate to the right again using the compass sensor for 90 degrees, then BeBot will move forward against the shore in the third stage using a timer, and finally, in the fourth stage, it will repeat the second stage but move to the left instead of right and rotate 90 degrees using the compass sensor.

All sensors on the BeBot were functional and executing their specialized functions, which helps to ensure that the beach



cleaning robot's work process runs smoothly and without any problems that could ruin the robot. The Wi-Fi feature of the transceiver was used to control the BeBot. By transmitting a signal with commands from the control box to the robot itself, the control of the robot has been achieved smoothly. It is worth to mention that BeBot has the potential to be upgraded to segregate the waste it collects by incorporating a high-resolution camera for identifying the collections in which

that artificial intelligence (AI) will be implemented. BeBot has won the first prize for the electronics projects during the senior project exhibition of the College of Engineering at University of Bahrain in the first semester of the academic year 2022/2023.



SMART ROBOTIC NURSE

Project Team:

- Husain Abdulla Butarada
- Ahmed Saleh Alshowaikh
- Abdulla A.Hussain Aldaghas

Supervisor:

Dr. Salwa Saleh Baserrah

We have witnessed unprecedented amounts of hard work by medical professionals during the pandemic (COVID-19), particularly by those whose jobs require them to be in intensive care units or who are dealing with a high volume of patients. In emergency situations, work directly with patients by responding to their hospital calls and conducting examinations or providing care. Statistics show that medical professionals often do not get the rest they need to be at their best on the job, which has negative effects on their health on both the physical and mental levels. Because of the close proximity of patients and healthcare workers, the COVID-19 transmission rate is extremely high. Abdulla AbdulHussain Aldaghas, Husain Abdulla Butarada and Ahmed Saleh Al-Showaikh, all senior students in the Department of Electrical and Electronics Engineering at the University of Bahrain, worked closely with their supervisor, Dr. Salwa Saleh Baserrah, in the course of their graduation project, to create a device that aids the medical staff and protects them from infections. The project's central concept is centered on the development of a smart robot device with the dual purpose of reducing the amount of time spent in direct contact patient care and the workload of medical professionals. To emphasize, during the epidemic there have been very few automated instruments to aid medical workers at medical centers

and hospitals in the Kingdom of Bahrain. The project was carried out by programming the robot's main controller (ESP 32), which is a central console equipped with Wi-Fi. Following that, several sensors were programmed and interfaced with the control unit, including the room temperature and humidity sensor (AHT10), which were programmed to continuously measure room temperature and humidity every 1.5 seconds. Additionally, a human body temperature sensor (MLX90614), which measures body temperature as soon as an object is felt close to it, as well as a combined heart rate and oxygen sensor that measures heart rate and the percentage of oxygen in the blood (Max30100). The central control unit and the electric motors driven wheels of the device are powered by a 12-volt battery. Furthermore, all these sensors are linked to Blynk software, which is downloadable to the doctor's smartphone and allows him to read and record all the patient's information.

In terms of smart robot control, there are two options. The first is through the (Blynk) application, where the nurse or doctor may quickly move it via Wi-Fi linked to the unit Control (ESP). The second way employs three sensors, two ultrasonic sensors and one infrared sensor, through which the nurse can remotely guide the movement of the smart robot by a move of hand, in which it can be easily moved in the direction



of hand's movement. The purpose of having two control systems is to increase the robot's reliability and security.

The 18th Middle East Corrosion Conference and Exhibition (MECC)

13 - 16 November 2023, Gulf International Convention Centre, Gulf Hotel, Kingdom of Bahrain

The biennial corrosion conference and exhibition was launched in 1979 and has accompanied the development of the Gulf region in becoming the global capital of reliable energy. It is recognized as a prime venue for sharing knowledge among professionals in all areas of corrosion mitigation.

The number of professional and industrial delegates has steadily grown to cover all aspects of corrosion with representatives from around the globe.

Under the patronage of H.E. Dr. Mohammed bin Mubarak Bin Dainah, Minister of Oil and Environment, The Special Envoy for Climate Affairs in the Kingdom of Bahrain, The 18th Middle East Corrosion Conference and Exhibition (MECC) will be held during 13 - 16 November 2023, at the Gulf International Convention Centre, Gulf Hotel, Kingdom of Bahrain.

The 18th MECC is organized by AMPP Dhahran Saudi Arabia Chapter and the Bahrain Society of Engineers.

The conference will address several important topics with focus on the 4th Industrial Revolution (4IR) to accelerate the corrosion industry movement towards digital transformation. The 4IR digital technologies provide professionals and industry with predictive solutions and advanced analytics to proactively detect and manage corrosion risks. Due to the evolution of nonmetallic materials as one of the important industrial corrosion control practice, MECC will bring once again global focus on the new development and application of this material.

The 18th MECC introduces the 4th Industrial Revolution (4IR) Pavilion in addition to several new sections of conversations. The MECC 2023 will continue the successful sections of the previous conferences such as the Nonmetallic Pavilion and the Exhibition Theatre and will provide a unique platform for professionals from all over the world over four days in Bahrain.

Under the patronage of
H.E. Dr. Mohamed bin Mubarak Bin Daina
Minister of Oil and Environment
Special Envoy for Climate Affairs
Kingdom of Bahrain

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ARAB ICT CONFERENCE 2023

6 - 7 December 2023, Gulf International Convention Centre,
Gulf Hotel, Kingdom of Bahrain

ICT experts and decision-makers wish to improve the adoption of emerging technologies into infrastructure development. The ARAB ICT CONFERENCE 2023 provides a unique opportunities to strategically address challenges associated with the UN Sustainable Development Goals (SDGs), in particular SDG 9 targeted to develop quality, reliable, sustainable and resilient infrastructure, which is the foundation for a successful and sustainable community.

Under the patronage of H.E. Shaikh Khalid bin Abdulla Al Khalifa, Deputy Prime Minister, Kingdom of Bahrain, the Federation of Arab Engineers and the Bahrain Society of Engineers are pleased to announce the organization of the Arab ICT Conference 2023, which will be held in the Kingdom of Bahrain from 6 - 7 December 2023 with the theme "Digital Transformation for Sustainable Infrastructure". The Arab ICT Conference has steadily expanded since its inception in 2010 to become a leading conference in the region. In its 7th edition, the conference will be associated with an exhibition to showcase the latest technologies, technical innovations, new applications, best practices, cutting-edge research, and case studies.

This conference is intended for scientists, ICT experts and decision-makers who wish to improve the adoption of emerging technologies into infrastructure development. The conference provides a unique opportunities to strategically address challenges associated with the UN Sustainable Development Goals (SDGs), in particular SDG 9 targeted to develop quality, reliable, sustainable and resilient infrastructure, which is the foundation for a successful and sustainable community.

The Arab ICT conference aims to provide a platform for exchanging ideas, information, and experiences among academics, researchers, consultants, engineers, manufacturers and decision-makers who seek to adopt emerging technologies to improve infrastructure delivery and operation. The conference will serve as a medium to discuss and evaluate the latest trends, opportunities, challenges, policies and innovative technologies in infrastructure development.



Conference Patron
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