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Bapco Modernization
Project (BMP)

BSE organizes the 26th Gulf
Engineering Forum and the
Energy Management Conference

A Journey with His Excellency
Dr. Abdul Latif Jassim Kanoo

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BAHRAIN
SOCIETY OF
ENGINEERS

P.O. Box: 835, Manama

Kingdom of Bahrain

Email: mohandis@bse.bh

Website: www.bse.bh

Please send your articles to:

Bahrain Society of Engineers

Tel: +973 1772 7100

Fax: +973 1782 7475

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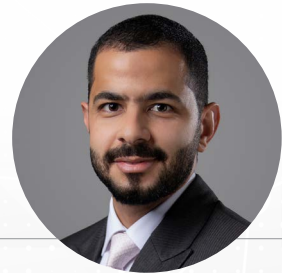
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Speech of the Editor-in-Chief



Professor Isa Qamber

ALMOHANDIS

The Bahraini Society of Engineers, given its extensive experience in the field of engineering, desired in this issue of Al-Mohandis magazine to meet with one of the pioneers of engineering who worked alongside his colleagues. They were twenty engineers who took it upon themselves to establish a society that would bring together engineers in the Kingdom of Bahrain to exchange expertise and discuss engineering matters, as well as new developments in the field. This issue also touched on several topics, some in Arabic, some in English, and some in both languages. Young engineers were not overlooked, as the magazine included an interview with a young engineer couple. The issue concluded with four graduation projects by bachelor's students.

Al Mohandis had the privilege of meeting one of the engineers who played a pivotal role in establishing the Bahrain Society of Engineers 1972. This individual has left significant engineering footprints throughout his career after obtaining his university degree in engineering. The meeting was with His Excellency Dr. Engineer Abdul Latif bin Jassim Kanoo. Dr. Abdul Latif, along with his colleagues, worked diligently to create an entity for this society, which aims to promote engineering concepts and awareness through continuous engineering activities. It is also worth noting that he was the first president of this generous society. Additionally, Dr. Abdul Latif Kanoo earned the trust of the leadership in Bahrain, as he held the position of Undersecretary of the Ministry of Housing during the tenure of His Excellency Shaikh Khalid bin Abdulla Al Khalifa, who was the Minister of Housing at that time. The Bahrain

Society of Engineers has contributed to introducing Bahrainis to the field of engineering as both a science and a profession, thanks to the efforts of Dr. Abdul Latif and his colleagues in its establishment. It is also important to acknowledge that Dr. Abdul Latif Kanoo received numerous honors and recognitions throughout his long professional career, by the grace of God Almighty. Among these honors was the Bahrain Medal, awarded in 1990 by the late Amir of Bahrain, His Highness Shaikh Isa bin Salman Al Khalifa, may he rest in peace. This medal is the highest civilian honor granted to outstanding innovators in the Kingdom of Bahrain.

Following that, the focus shifts to the feature of the issue, which discusses the Bahrain Petroleum Company (BAPCO) Modernization Project (BMP), inaugurated on December 18, 2024, coinciding with Bahrain's 53rd National Day and the Silver Jubilee of the King's reign, marking 25 years of progress. This project is the largest strategic investment in Bahrain's history, with operational activities successfully commencing and plans for continuous improvements extending until 2025. The project supports the government's 2023-2026 plan, "From Recovery to Sustainable Development," and

enhances governmental priorities such as economic development and investment attraction. The project includes 21 new processing units, 16 complementary units, 22 substations, and the modernization of 53 existing units. Environmentally, the project has achieved significant improvements, including a 57% reduction in sulfur dioxide emissions and a 50% decrease in seawater consumption. Advanced emissions monitoring systems have also been installed. The project has received international awards, including the Five-Star Award in Occupational Health and Safety from the British Safety Council.

After that Al-Mohandis highlight on the article written by the engineer Saeed Asbool, the member of the Bahraini Society of Engineers in Arabic and English, entitled "Construction Contract Securities". The article concentrates on the construction contract securities, negotiations over these securities often begin early and can extend beyond project completion, with owners imposing additional guarantees beyond standard contract models like FIDIC or JCT. Owners specify required guarantees, securities vary by type.

Engineer Mohammed Abdulla Abu-foor for addressed the topic of "Engineering Inspection and Non-Destructive Testing: A Pillar for Ensuring Quality and Sustainability, and an Investment in Developing National Cadres in Industrial Sectors." In his article, he discussed the importance of the oil, gas, and petrochemical sectors in the Gulf economy, the concept of engineering inspection and non-destructive testing, their role in ensuring the quality and safety of oil and industrial facilities, the significance of compliance with local and international quality standards, the importance of ensuring sustainability in the oil sector, and statistics on the job market for engineering inspection and non-destructive testing in the Gulf region. He concluded his article with points that reinforced his argument.

The article written in Arabic and English by Dr. Bassam Al-Hamad,

titled "Optimizing Sustainability in Manufacturing Enterprises: A Sinusoidal Approach to Control Valve Stiction" discusses how the study presents innovative solutions to address the issue of stiction in industrial control valves, which causes process disruptions, increased energy consumption, and higher operational costs. The study proposes a sinusoidal compensation method that introduces smooth oscillations into the control signal, reducing static friction without causing excessive valve wear. This method was compared to traditional approaches such as pulse-based compensation and PID controller tuning.

This issue of Al-Mohandis magazine features an interview with two young engineers, Engineer Mohamed Hilal and Engineer Masooma Groof. They are the couple behind (M Square Design), working together to drive the company's success and achieve the highest levels of efficiency and quality in executing real estate and commercial projects in both Bahrain and Saudi Arabia. Their achievements and contributions were highlighted in their brief profiles.

In this issue of Al-Mohandis magazine, four projects undertaken by undergraduate students to earn their bachelor's degrees were highlighted. The first project addresses environmental issues and resource conservation while offering a solution for those unable to care for their crops. It utilizes renewable energy, specifically solar power, to

generate electricity, significantly reducing operational costs and dependence on non-renewable energy sources.

The second project focuses on designing multi-phase transformers for industrial applications. These transformers enable a six-phase source to maintain torque even in the event of a phase failure. This was achieved by converting three-phase sources into six- and five-phase sources using a zigzag transformer, requiring significant effort to align the precise phase angles for six- and five-phase systems.

The third project, titled "An AI-Powered Quadcopter Drone to Assist Rescuers in Aquatic Environments," involved equipping the drone with advanced AI algorithms to analyze captured footage accurately and identify drowning signals within moments. The primary goal is to ensure immediate intervention upon detecting a drowning person, allowing the drone to swiftly move toward the individual in danger.

Finally, the fourth project, developed by two students, is titled "Development of a VEX Robot for Autonomous Navigation and Object Retrieval." This autonomous robotic system uses advanced intelligent vision sensors to detect objects of specific colors—such as purple, orange, and yellow—enabling it to quickly and accurately identify target items. The project represents advancements in robotics and AI, revolutionizing automated retrieval systems.



The Bahrain Society of Engineers organizes the 26th Gulf Engineering Forum and the Energy Management Conference

His Excellency Shaikh Khalid bin Abdulla Al Khalifa, Deputy Prime Minister, inaugurated the 26th Gulf Engineering Forum and the Energy Management Conference, hosted by the Kingdom of Bahrain and organized by the Bahrain Society of Engineers in collaboration with the Gulf Engineering Union. The event took place on Tuesday, February 11, 2025, at the Gulf Convention Centre in Manama and lasted for three days.

This year's forum was held under the theme "Challenges of Energy Transition" and was officially sponsored by the Electricity and Water Authority, with support from Gulf Petrochemical Industries Company (GPIC), Bapco Energies, Gulf House Engineering, and Schlumberger (SLB). The event saw participation from Gulf engineering societies and organizations, alongside a select group of experts and engineers from various Gulf Cooperation Council (GCC) countries. They discussed the latest developments and challenges in the fields of engineering and energy.

On the occasion of the opening of the 26th Gulf Engineering Forum and the 2025 Energy

Management Conference, His Excellency Shaikh Khalid bin Abdulla Al Khalifa emphasized that the Kingdom of Bahrain places great importance on the energy transition process by adopting innovative initiatives and technologies and encouraging and supporting the use of renewable energy sources. These provide highly efficient solutions as a fundamental pillar of the comprehensive development journey led by His Majesty King Hamad bin Isa Al Khalifa, the King of the country, may God protect and preserve him, and followed by His Royal Highness Prince Salman bin Hamad Al Khalifa, the Crown Prince and Prime Minister, may God protect him.

الملتقى الهندسي الخليجي 26th GULF ENGINEERING FORUM مؤتمر ومعرض إدارة الطاقة ENERGY MANAGEMENT CONFERENCE & EXHIBITION 2025



بحضور
معالي الشيخ خالد بن عبد الله آل خليفة
رئيس مجلس الوزراء

"تحديات تحول الطاقة"
"Energy Transition Challenges"



Organizers



Organizers



His Excellency Shaikh Khalid bin Abdulla Al Khalifa, Deputy Prime Minister, during the honoring of Gulf engineering pioneers at the opening of the 26th Gulf Engineering Forum at the Gulf Convention Centre in the Kingdom of Bahrain, February 11, 2025.

His Excellency pointed out that the energy transition represents a strategic opportunity for the GCC countries, aiming to continue efforts to develop their economies to be more diversified, reduce carbon emissions, and enhance long-term energy security.

The Deputy Prime Minister highlighted the importance of continuing to strengthen joint efforts between the public and private sectors to achieve sustainable development goals, as they play a pivotal role in accelerating the pace of energy transition, developing the necessary infrastructure for the shift towards renewable

energy, and ensuring the achievement of the strategic goals of the region's countries.

His Excellency expressed his gratitude to the Bahrain Society of Engineers and the Gulf Engineering Union for organizing this professional gathering, which serves as an opportunity to enhance Gulf cooperation in the field of energy and provides an important platform for exchanging expertise and experiences among specialists and technicians. This contributes to developing innovative solutions that support the region's strategies in achieving energy sustainability and keeping pace with global transformations in this field.



During the opening of the 26th Gulf Engineering Forum and the 2025 Energy Management Conference, Dr. Raida Al Alawi, President of the Bahrain Society of Engineers and Chair of the 26th Gulf Engineering Forum, expressed her sincere thanks and appreciation to His Excellency Shaikh Khalid bin Abdulla Al Khalifa, Deputy Prime Minister, for gracing the event with his presence. This reflects His Excellency's continuous support for the Society, its goals, activities, and contributions aimed at developing and elevating the profession at local, regional, and global levels.

In her speech during the opening ceremony, Dr. Al Alawi emphasized the Society's keenness to actively participate in the activities of the Gulf Engineering Union, particularly the Gulf Engineering Forum, which the Society has consistently supported and participated in since its inception in 1997.

During the opening ceremony, His Excellency the Deputy Prime Minister honored pioneering engineers from the GCC countries, presidents of the Gulf engineering societies and organizations, winners of the Gulf Engineering Union Award for Excellence and Creativity in its 26th edition, and supporting individuals and institutions of the forum.

Dr. Raida Al Alawi
President of the Bahrain Society of Engineers



For his part, His Excellency Engineer Kamal bin Ahmed Mohammed, President of the Electricity and Water Authority (EWA), affirmed that the Kingdom of Bahrain, like other Gulf countries, has begun developing strategies to keep pace with rapid transformations in the energy sector.

His Excellency pointed out that each country adopts an approach that suits its specificities, enhancing its resilience in facing global transformations and transitioning to clean and sustainable energy sources.

He also affirmed that the region is witnessing significant progress in this field, thanks to technological advancements and increasing investments in energy projects.

In this context, His Excellency noted that the Electricity and Water Authority (EWA) is working within a strategic plan aimed at adopting solutions that align with the specificities of the Kingdom of Bahrain and address local challenges in line with international best practices.

He added that the Authority is working to diversify energy sources, enhance supply security, improve energy consumption and demand efficiency, and reduce carbon emissions in line with the Kingdom's commitments in the field of climate change.

His Excellency Engineer Kamal bin Ahmed Mohammed
President of the Electricity and Water Authority (EWA)



His Excellency Engineer Jamal Issa Al-Loughani, Secretary-General of the Organization of Arab Petroleum Exporting Countries (OAPEC), praised the excellent organization of the 26th Gulf Engineering Forum and the choice of the theme "Challenges of Energy Transition" for discussion. He pointed out that the main challenge facing oil and gas producing and exporting countries is the insistence on linking a carbon-free environment with calls to reduce dependence on fossil fuels and transition to renewable and sustainable energy. He called for these transitions to be balanced, gradual, responsible, and based on scientific foundations to achieve a fair, balanced, and sustainable transition to low-carbon energy. He noted that the events of the past few years, especially the Russian Ukrainian crisis, have proven that energy transition cannot be achieved without fossil fuels. He considered that the initiatives adopted by Arab oil and gas exporting countries form part of the solution in dealing with the transition to clean energy and will not be a cause of climate change. He emphasized that the future of sustainable energy requires the adoption of all energy sources and technologies without exception and a very high level of international cooperation and investment.

Engineer Jamal Issa Al-Loughani

Secretary-General of the Organization of Arab Petroleum Exporting Countries (OAPEC)



Engineer Mohammed Ali Al Khozaae, Secretary-General of the Gulf Engineering Union, expressed his gratitude to His Excellency the Deputy Prime Minister for gracing the opening of the 26th Gulf Engineering Forum and the 2025 Energy Management Conference.

In his opening speech, Al Khozaae emphasized the leading and pivotal role in developing policies and standards through contributing to the preparation of regulations and standards for energy efficiency and renewable energy and advising decision-makers on effective policies and strategies. He called on them to be the leaders and driving force for developing policies and legislation supporting effective and sustainable energy transition and supporting energy management efforts towards a more sustainable and efficient future and assisting in analyzing the technical and economic feasibility of proposed policies.

Al Khozaae pointed out the ability of forums and conferences, including the Gulf Engineering Forum, to develop and advance Gulf engineers to assume their leadership role in moving forward to achieve a sustainable future in the GCC countries.

Engineer Mohammed Ali Al Khozaae

Secretary-General of the Gulf Engineering Union



26th GULF ENGINEERING FORUM ENERGY MANAGEMENT

Organizers



BAHRAIN
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ENGINEERS

The Energy Management Conference featured 36 technical presentations, showcasing outstanding research and practical solutions during specialized sessions.

Valuable insights, into energy management, and 36 technical presentations were presented over three days... Energy Management Conference 2025... A remarkable success for "BSE"

The 26th Gulf Engineering Forum, held from February 11-13, 2025, at the Gulf Convention Center in the Gulf Hotel, Kingdom of Bahrain, concluded as a resounding success. Organized by the Bahrain Society of Engineers in partnership with the Gulf Engineering Union, the forum united engineers, researchers, and industry leaders from across the Gulf region to tackle the pressing theme of "Energy Transition Challenges."

A Catalyst for Progress:

Inaugurated by His Excellency Shaikh Khalid bin Abdulla Al Khalifa, Deputy Prime Minister of the Kingdom of Bahrain, the forum underscored the critical role of public-private collaboration in achieving energy transition goals. The event highlighted Bahrain's unwavering commitment to sustainable development and reinforced regional cooperation in engineering and energy innovation.

The 26th Gulf Engineering Forum has set a new benchmark for future events, leaving a lasting

impact on the engineering community and paving the way for a more sustainable and prosperous future in the Gulf region.

Keynote Speakers and Inspiring Insights:

The forum featured four distinguished keynote speakers, including globally renowned experts and industry pioneers, who shared cutting-edge perspectives on energy management and sustainable engineering practices. Their thought-provoking presentations ignited discussions and



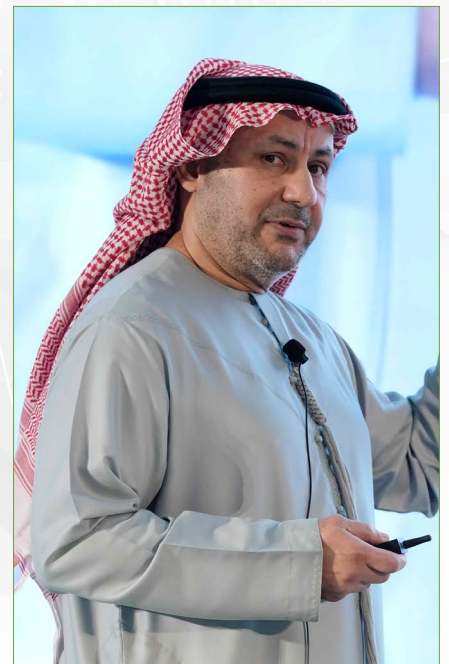
Dr. Raeda Al-Alawi, President of the Bahrain Society of Engineers, Eng. Abdul Majeed Al-Qassab, Chairman of the Energy Management Conference (left), Eng. Faisal Al-Mahroos, Chairman of the Conference Advisory Board (third from right), and Eng. Jameel Khalaf Al-Alawi (right), with the conference's keynote speakers: Professor Kamel Ben Naceur, Professor Mohan Kelkar, and Eng. Hesham Zubari.



Prof. Kamel Ben Naceur



Prof. Mohan Kelkar



Eng. Hesham Zubari

inspired attendees to explore innovative solutions for the region's energy transition.

Conference Topics and Key Highlights:

The event addressed critical topics such as renewable energy, decarbonization, and the latest advancements in engineering technologies. With technical sponsorship from the World Federation of Engineering Organizations (WFEO), the Federation of Arab Engineers (FAE), and the Society of Petroleum Engineers (SPE), the forum served as a dynamic platform for knowledge exchange and collaboration.

Program Achievements:

Over the course of three days, the forum achieved significant milestones, including:

- 4 Keynote Speakers who delivered invaluable insights into energy management and sustainable engineering practices.
- 7 Executive Panelists who engaged in stimulating discussions on clean energy challenges specific to the GCC region.
- 36 Technical Presentations showcasing groundbreaking research and practical solutions across specialized sessions.
- 2 Parallel Technical Pre-Conference Workshops providing hands-on expertise in key areas related to energy transition.





Various shots from the Energy Management Conference 2025 sessions.







A group photo at the closing ceremony of the Energy Management Conference, organized by the Bahrain Society of Engineers in cooperation with the Gulf Engineering Federation, February 13, 2025.



At the conclusion of the 26th Gulf Engineering Forum and the Energy Management Conference 2025, **Recommendations were made to accelerate decarbonization, enhance energy efficiency, and ensure the feasibility of clean energy solutions**

Participants in the 26th Gulf Engineering Forum and the Energy Management Conference 2025 emphasized that the energy transition in the Gulf region stands at a critical crossroads. They called for a unified approach to accelerate decarbonization, enhance energy efficiency, and ensure the economic viability of clean energy solutions.

Dr. Raida Al-Alawi, President of the Bahrain Society of Engineers, delivered the closing speech, while Engineer A. Majeed Al-Qassab presented a speech that included several recommendations regarding energy transitions. These recommendations focused

on ambitious policies that achieve goals and ensure a sustainable, secure, and economically viable energy future for the region.

This took place at the conclusion of the 26th Gulf Engineering Forum and the Energy Management Conference 2025 on February 13, 2025. The forum, which lasted for three days, saw broad participation from stakeholders in the energy and industrial sectors. It featured speeches by a select group of specialists, researchers, experts, and industry leaders from the region and around the world.

His Excellency

Dr. Abdul Latif Jassim Kanoo

Establishment Memories:

Between the Bahrain Society of Engineers,
the Ministry of Housing and Beit Al Quran
(House of Quran)



In this issue of Al-Mohandis magazine, we interview an engineering figure who played a prominent role in establishing the Bahrain Society of Engineers (BSE). He was among the pioneering Bahraini engineers working in the field of public works in Bahrain, the first Undersecretary of the Ministry of Housing, and the visionary founder of Beit Al Quran (House of Quran). For the first time, an engineer has been a guest of Al-Mohandis magazine twice. Dr. Abdul Latif Jassim Kanoo. was a guest in the fifth issue of the magazine, published in the 1980s. Between that issue and this one lies a journey filled with achievements and projects.

In the following pages of Al-Mohandis magazine, we explore milestones from the career of our guest in this issue, His Excellency Dr. Abdul Latif Jassim Kanoo, one of the founders of the Bahrain Society of Engineers (BSE) and its first president. Welcome Dr. Abdul Latif

Al-Mohandis magazine, published by the Bahrain Society of Engineers, is honored to host you for the second time, approximately 45 years after your first appearance in its fifth issue published in the 1980s. In this issue, we aim to acquaint the readers of Al-Mohandis with the most significant professional milestones in the career of Engineer Dr. Abdul Latif Jassim Kanoo during this period. Among the most notable achievements was earning the Royal Trust in 1975 and being appointed Undersecretary of the Ministry of Housing, as well as the conception and establishment of your pioneering project, Beit Al-Quran, through your dedicated efforts.

To begin with, the readers of Al-Mohandis magazine would like to know about your early days in the engineering profession.

I studied building, civil, and structural engineering at Imperial College, University of London, in England. After graduating as an engineer and before returning to Bahrain, I traveled to several countries, starting with England, then Lebanon, Kuwait, Saudi Arabia, and finally Bahrain. In these countries, I lived and gained experience in the construction sector and related fields, as my family wanted me to gain expertise in this area. Upon

returning to Bahrain, I began working in the aluminum industry, exporting Bahraini aluminum products to the region. Later, I joined the Public Works Department, working closely with the late Mr. Yousif Ahmed Al-Shirawi, who was the minister responsible for public works and development, overseeing infrastructure, construction, and urbanization.

At that time, Bahrain was experiencing a boom and renaissance. The beginnings were modest but evolved rapidly in a short period. I must say that one of the key factors contributing to this development was the



His Highness Shaikh Mohammed bin Mubarak Al Khalifa, Deputy Prime Minister and President of the Supreme Council for the Development of Education and Training that time, at the time, on Monday (January 23, 2017) during his patronage of the launch ceremony of the book "Research and Studies" by Jalil Ibrahim Al-Arayed in University Education and Science Teaching" at the Beit Al Quran (House of Quran), on the initiative of the founder of the Beit Al Quran (House of Quran), Dr. Abdul Latif Jassim Kanoo, and the hosting of the Beit Al Quran (House of Quran) for the launch ceremony of the book prepared and compiled by Dr. Mansour Sarhan.

late His Highness the late Amir of Bahrain Shaikh Isa Bin Salman Al Khalifa, may he rest in peace. He took a personal interest in following up on the country's progress. If he noticed something lacking or in need of maintenance, he would inform and guide us, then follow up with us afterward.

Could you share your academic journey in higher education?

Driven by a desire for self-improvement and at the beginning of my professional career, I pursued an advanced diploma in engineering, the Diploma of Imperial College (D.I.C). I also became a member of the Engineering Society in England, which grants membership based on strict criteria and only after fulfilling all requirements. At the time, I held the diploma along with memberships in both the English and American Engineering Societies. I continued my higher education, earning a master's degree from the University of Pittsburgh in Pennsylvania and a Ph.D. from the University of Texas in the United States in 1970.

As one of the founders and the first president of the Bahraini Engineers Society, the readers of Al-Mohandis, many of whom are young members of the society, are eager to learn about the behind-the-scenes story of the establishment of the Bahrain Society of Engineers (BSE).

With the launch of several major economic projects in Bahrain in the late 1960s and early 1970s, such as the Aluminum Bahrain (ALBA) smelter, we, as engineers, transitioned from a limited scope to active engineering life, involving building homes, planning, and constructing roads as a fundamental aspect of the country's development. These initiatives led to significant projects and companies that became part of daily life in Bahrain. The Bahraini government, led by the late His Royal Highness Prince Khalifa bin Salman Al Khalifa, the former Prime Minister, aimed to drive Bahrain's progress and development through Bahrainis, equipping those without experience with the necessary skills to lead their country's development.

Amid this new economic and engineering movement, we gathered a group of 20 engineers and delivered an



A group of members of the Bahrain Society of Engineers visit the production field of BAPCO in 1972, at the beginning of the activities of the society, which was established in that year and Dr. Abdul Latif Jassim Kanoo was elected its first president.

inspiring lecture on the importance of development and training, emphasizing their role in the nation's progress. I had several points of agreement with His Excellency Shaikh Khalid bin Abdulla Al Khalifa, Deputy Prime Minister, and we proposed to the Prime Minister that these engineers complete their studies abroad, either through advanced training courses or by obtaining engineering degrees for those without one. We also encouraged them to join international engineering organizations to gain expertise and competence in their respective fields. We held weekly meetings for the group of 20 engineers under the umbrella of His Excellency Shaikh Khalid bin Abdulla Al Khalifa.

These 20 engineers, united by their love for engineering and their country, later played a significant role in Bahrain's development. They were integrated into the professional field, collaborating with various companies, including foreign construction companies operating in Bahrain, as well as local engineering firms. We began discussing assigning responsibilities to Bahraini engineers and giving them opportunities to lead.

Regarding the efforts to establish the Bahrain Society of Engineers (BSE), I recall requesting a meeting with the late His Highness Shaikh Isa bin Salman Al Khalifa, the former Amir of Bahrain. I asked him not to reject my proposal before hearing it. He agreed to listen, and after

I proposed establishing an engineers' society, he initially responded that forming societies was prohibited in Bahrain. However, I explained that this society would serve Bahrain by developing Bahraini engineers who could contribute to the country's projects instead of relying on foreign engineers, particularly from England. We would provide Bahraini engineers to oversee projects.

The late Amir then asked, "Do you believe you have the competence and capability?" I replied that one must strive, and success comes from God. He asked what we intended to do with the society, and I explained that we wanted to establish a society that would gather engineers to build Bahrain. Finally, he agreed to the establishment of society on the condition that I gather information about the engineers and the society and present it to him again. In the second meeting, when I reiterated the idea, he again mentioned that forming societies was prohibited. However, I spoke to him and the late Prime Minister in a way that convinced them. I repeated my request, emphasizing that the goal was to gather engineers to develop the country instead of relying on foreigners. Ultimately, he agreed, calling it a "great idea," and asked what was needed. I requested three immediate things: his approval, his presence at the society's inauguration, and a contribution of 10,000 Bahraini Dinars to kickstart the society.



His Excellency Shaikh Khalid bin Abdulla Al Khalifa, Deputy Prime Minister (Minister of Housing at the time) inspecting the Bahrain Society of Engineers headquarters project, accompanied by Dr. Abdul Latif Jassim Kanoo (Undersecretary of the Ministry of Housing at the time). On the left of the picture are Eng. Emad Abdulrahman Almoayed (President of the BSE at the time), and Dr. Eng. Dheya A. Aziz Tawfiqi (Board Member at the time)

Afterward, we began the licensing process, and the society was officially established on July 1, 1972, as the first professional society in Bahrain. Following its establishment, we held the first general assembly meeting with the 20 founding members and formed the first administrative board or board of directors. I was elected president, Engineer Ibrahim Khalil Al-Moayyed as vice president, Dr. Engineer Issam Fakhro as secretary, Engineer Abdul-Rahman Fakhro as treasurer, and Engineers Jameel Al-Alawi and Abdullah Juma as administrative members.

Regarding the Bahrain Society of Engineers (BSE), the society's headquarters in Juffair stands as one of the major projects and a defining milestone in the society's journey. What efforts preceded the execution of this beautiful architectural landmark?

When the Bahrain Society of Engineers (BSE) was established in 1972, we did not have a permanent

headquarters or property owned by the society. We initially met in temporary locations, such as the Graduates Club, and later in an apartment in the Kanoo Complex in Mahooz. However, from the beginning, we sought a permanent headquarters and obtained a building at the Royal Air Force (RAF) base in Muharraq for several years.

The current permanent headquarters' story began when I noticed a piece of land in the Juffair area. I presented the idea of the headquarters and the land to Shaikh Khalid bin Abdulla Al Khalifa, and we began preparing a construction plan. I presented the plan to the late His Royal Highness Prince Khalifa bin Salman Al Khalifa, the former Prime Minister, who asked if we had the land. I explained that we were requesting the land from him and his assistance in securing and registering it in the society's name. He promised his support, and we received the land as a gift from the late

Amir His Highness Shaikh Isa bin Salman Al Khalifa. It was a large plot, sufficient for building the headquarters and parking spaces. We obtained this land several years after society's establishment.

The construction of the headquarters was undertaken by society's board of directors in later periods. We are grateful that the society was able to secure this land and build this beautiful headquarters, which now serves as a hub for all engineers in Bahrain. During the construction project, I had the honor, as Undersecretary of the Ministry of Housing, to accompany His Excellency Shaikh Khalid bin Abdulla Al Khalifa, who was then the Minister of Housing, on several visits to inspect the construction progress. I am thankful to God for seeing the efforts we began at the society's founding come to fruition through the work of subsequent administrations, which completed and inaugurated the project on June 23, 1992, under the patronage of the late Amir His Highness Shaikh Isa bin Salman Al Khalifa. The society's president at the time was Engineer Emad Al Moayyed.

Undoubtedly, you have been involved in several major projects in Bahrain during your early years in the engineering profession. Perhaps one of the pioneering projects was the Isa Town project. Could you provide the readers of Al-Mohandis with a glimpse of that project during that era?

After Bahrainis entered the field of engineering as a science and profession in the government, and I was one of them in the mid-1960s, we began taking on significant responsibilities in executing government projects. Among the first major projects in my career was the Isa Town project.

This ambitious government project was laid in 1963, and we began with great enthusiasm and pride, as it was the first massive housing project, not only in Bahrain but in the entire Gulf region. The project's execution continued for five years, during which we raced against time, overseeing engineering operations across the project according to various specializations and tasks.

Bahrain was set to inaugurate this project on November 13, 1968, with a grand ceremony at a large sports stadium in Isa Town. Several names were proposed for the town, and it was ultimately named "Isa Town" in honor of the late Amir His Highness Shaikh Isa bin Salman Al Khalifa. During the grand ceremony, the first

phase of the town, comprising around 500 houses, was inaugurated.

Over the years, we have worked on developing and expanding the town. With the establishment of the Ministry of Housing in 1975, efforts were made to increase housing units, develop various projects, and build numerous facilities, including schools, health centers, and roads, transforming the town from a limited housing area to a vast, futuristic town with diverse services.

Therefore, I consider the Isa Town project as the beginning of the housing renaissance that the Kingdom of Bahrain is witnessing today, after applying engineering and execution strategies to launch other housing towns/cities in the country.

Dr. Abdul Latif Jassim Kanoo earned the leadership's trust and was appointed Undersecretary of the Ministry of Housing in 1975. How does Dr. Kanoo view this experience and this high position in serving and developing Bahrain in the housing sector?

The establishment of the Ministry of Housing in Bahrain was a unique experience in the region at the time. When I joined the Public Works Department under the leadership of the late Minister Mr. Yousi Al-Shirawi, who was the head of the Development and Engineering Services Department (which became a ministry after independence in 1971), I met Engineer Shaikh Khalid bin Abdulla Al Khalifa, who was responsible for the housing sector under the Development and Engineering Services Department. This department was created to oversee all matters related to engineering and construction. Given the presence of foreign engineering consulting firms and experts, there was a need for experienced and competent engineers. We developed a strong understanding and coordination, especially since Shaikh Khalid bin Abdulla possessed several admirable qualities, including his expertise in public works, knowledge of roads and institutions, and his cooperative nature on both official and personal levels, along with his excellent relationships and high morals.

Around mid-1975, Shaikh Khalid bin Abdulla informed me that it had been decided to establish a Ministry of Housing, with him as its minister, and he proposed that I join him in the ministry. My primary responsibility would be liaising with consulting firms and companies, working closely with them. Drawing on my experience in Saudi



Dr. Abdul Latif Jassim Kanoo (Founder of Beit Al Quran), explaining the contents of Beit Al Quran to several Bahrain guests.

Arabia and Kuwait, I found it beneficial in collaborating with foreigners in the field, including Lebanese, Egyptian, Indian, and other nationalities working in construction and engineering consulting services. We were directly responsible for supervising and overseeing them, which required expertise, competence, and ability. I communicated with them sincerely and efficiently, whether in their language, dialect, or logic, and it was not an easy task. His Excellency Shaikh Khalid bin Abdulla was always encouraging and supportive, expressing his great trust in me as his deputy in the ministry.

In truth, I found cooperation and support from Shaikh Khalid bin Abdulla even before the ministry's establishment and our appointment to it. This was aided by three admirable qualities in him: his high morals, his connection to the family, and his membership of the Cabinet since his appointment. He was also in contact with the late Amir and the late Prime Minister.

Therefore, many of the proposals and projects we coordinated were presented to the Cabinet. With Shaikh Khalifa's knowledge of the background and details of these proposals and projects, along with Shaikh Khalid's persuasive abilities, many achievements in the

construction sector in Bahrain were realized.

It is well known locally and internationally that the Beit Al-Quran project is Dr. Abdul Latif Jassim Kanoo's brainchild, from conception to establishment, supervision of execution, and management. Could you provide the readers of Al-Mohandis with an overview of this significant cultural project and its stages?

I believe the idea of establishing Beit Al-Quran stemmed from my passion for knowledge. As an engineer with a love for architecture, particularly Islamic architecture, and a long-standing interest in Islamic arts and manuscripts, I am grateful to have collected a distinguished collection of Islamic art, considered one of the rare private Islamic collections in the world. I also have a passion for collecting postage stamps, Bahraini heritage, and oil paintings, which I seek to acquire wherever I travel. This led me to the idea of establishing a museum or center to house these Islamic artifacts.

The idea received widespread acclaim and support from everyone who learned about the project, as it is a unique initiative that brings together Islamic artifacts



His Excellency Shaikh Khalid bin Abdulla Al Khalifa, Deputy Prime Minister, during the honoring of Dr. Abdul Latif Jassim Kanoo at the ceremony organized by the Kanoo Cultural Center on March 29, 2022, in honor of his sincere efforts and in appreciation of his national contributions.

from different eras, including various copies of the Quran, showcasing their history, sizes, and forms to the public. It also preserves these artifacts from loss and ensures they remain a legacy for future generations in a dignified and beautiful manner.

Thus, once the idea and project studies were presented, the project received widespread support and positive reception. Beit Al-Quran was established, thanks to God, with the support of several leaders, kings, princes, presidents, and dignitaries, may God reward them all. In summary, we are grateful to God for the completion of this landmark as a significant cultural and Islamic center within the Arab and Islamic world. Beit Al-Quran houses numerous rare artifacts and manuscripts, and its library contains around 30,000 volumes.

Speaking of books, we would like to mention that you are a prominent researcher, particularly in the field of Islamic arts and architecture, and have authored several works. Could you highlight some of your most important publications?

I have authored several works in various fields, particularly in Islamic arts and history. Among the most

notable publications are: An Hour with the Pen, Through History, Lessons from Life, Hearts United – Bahrain and Saudi Arabia, In the Footsteps of the Prophet (PBUH), Bahraini Horizons, Selected Islamic Arts, Arabic Numerals: The Source of Human Civilization (published in 1996), and The First Prophetic Letters: A Call to Islam. I have also published numerous research papers and studies in reputable and peer-reviewed journals and periodicals.

What are the most significant honors Dr. Abdul Latif Jassim Kanoo has received in his professional or community life?

I have been honored and recognized numerous times throughout my long professional career, both in Bahrain and abroad.

Your excellency, what would you like to add at the end of this interview?

I can only thank the organizers of Al-Mohandis magazine and wish them success. I also hope our engineers continue towards excellence and innovation.



His Excellency Shaikh Khalid bin Abdulla Al Khalifa, Deputy Prime Minister and Dr. Abdul Latif Jassim Kanoo during the opening of Abdul Rahman Kanoo School (DIYAR, Diyar Al Muharraq) on Tuesday, October 17, 2023. In the presence of His Excellency Dr. Mohammed Bin Mubarak Juma, the Minister of Education and several senior officials.

Dr. Abdul Latif Jasim Kanoo: Honorary Medals and Certificates of Appreciation

Honorary Medals and Certificates:

- Honorary Doctorate from Inha University, South Korea.
- The Arab Historian Medal from the Union of Arab Historians in 1987.
- The Bahrain Medal in March 1990 (the highest civilian medal awarded in Bahrain to distinguished innovators).
- The Shaikh Isa bin Salman Al Khalifa Medal in October 1999.
- The Medal of the Arab Republic of Egypt in Arts and Culture (First Class), presented by His Excellency President Mohamed Hosni Mubarak of Egypt in April 2000.

Official Certificates of Appreciation:

- Special Appreciation Certificate from the Bahrain Society of Engineers (BSE).
- Honorary Appreciation Certificate on the occasion of the 25th anniversary of the Bahrain Society of Engineers (BSE).
- Appreciation Certificate and Gold Medal for the Career work in Bahrain.
- Appreciation Certificate from the Bahrain Philanthropic Society.

- Appreciation Certificate from the State of Kuwait on the occasion of Kuwait's Liberation.
- Appreciation Certificate from the Bahrain Historical & Archeological Society for continuous contributions.
- Appreciation Certificate from the Ministry of Social Development (2005).
- Appreciation Certificate from His Highness Shaikh Humaid bin Rashid Al Nuaimi, Member of the Supreme Council (Ruler of Ajman) in 2011, in recognition of his impactful role in community services.
- Appreciation Certificate from the Bahrain Society of Engineers honor of his efforts as one of its founders and its first president, on the occasion of the Society's Golden Jubilee on March 15, 2022.
- Appreciation Certificate in recognition of his initiative to establish Beit Al-Quran (House of the Quran) under the Abdul Rahman Kanoo Cultural Center on March 28, 2022.
- Appreciation Certificate and the HRH Prince Khalifa bin Salman Al Khalifa Award for Quranic Personality (the first of its kind in the Kingdom of Bahrain), presented by Al-Noor Charity Welfare on March 20, 2024

Bapco energies



Bapco Modernization Project (BMP)

Under the patronage of His Majesty King Hamad bin Isa Al Khalifa, King of the Kingdom of Bahrain, and in the presence of His Royal Highness Prince Salman bin Hamad Al Khalifa, the Crown Prince and Prime Minister, the inauguration of the Bapco Modernization Project (BMP) was held on the evening of Wednesday 18 December 2024. This grand event coincided with Bahrain's celebrations of its 53rd National Day and the Silver Jubilee of His Majesty's accession, commemorating 25 years of progress and development under His Majesty's reign. With the inauguration of the project, the Bapco Modernization Project (BMP) is successfully refining crude oil, and will be undergoing a continuous sequence of refining improvement extending into Q4 2025.

The BMP stands as the largest strategic investment ever undertaken in the history of the Kingdom of Bahrain, marking a major milestone achieved during the prosperous reign of His Majesty the King. The project embodies His Majesty's visionary directives to execute transformative projects that drive economic development, while leveraging

Bahrain's natural energy resources for sustained growth and progress. Aligned with His Majesty's aspirations and the vision of His Royal Highness Prince Salman bin Hamad Al Khalifa, Crown Prince and Prime Minister, the BMP supports Bahrain's 2023-2026 Government Plan, "From Recovery to Sustainable Development."



His Majesty King Hamad bin Isa Al Khalifa, graciously inaugurated, on Wednesday, December 18th, 2024, the Babco Refinery Modernization Project, the largest strategic project in the energy sector in the history of the Kingdom of Bahrain, in the presence of His Royal Highness Prince Salman bin Hamad Al Khalifa, the Crown Prince and Prime Minister.



It advances key government priorities, including sustainable economic development and investment attraction, and positions Bahrain as a global leader in innovation and sustainability.

As the largest investment in the Kingdom of Bahrain's 90-year energy history, the BMP represents a strategic commitment by the government to strengthen the energy sector, led by Bapco Energies, the integrated energy company leading the energy transition in Kingdom of Bahrain. With multi-billion-dollar capital investments, the BMP underscores Bahrain's readiness to meet future challenges, leaving a lasting legacy of economic impact. The project has allowed Bapco Refining to employ over 500 Bahraini engineers, including technical support functions and non-technical functions, as well as develop them into industry leading professionals. This is done through direct involvement throughout all phases of the project: Feasibility Study, Engineering Design Package Development,

Front End Engineering Design, Detailed Design, Construction, Commissioning, Start-Up, and Operation.

The BMP has provided an exceptional opportunity for over 500 Bahraini engineers, technicians, and other non-technical fields who have been instrumental to its success. These engineers were mobilized to Engineering, Procurement, and Construction (EPC) contractor home offices in various countries such as Rome Office (Italy), Madrid Office (Spain) and Seoul (Korea) working with top tier EPC contractors such as Technip Energies, Técnicas Reunidas, and Samsung Engineering and actively contributed to the detailed engineering, site management of construction activities in land (Bahrain), commissioning, and startup phases of the project. Their direct involvement throughout all project phases — from the feasibility study, engineering design packages, and front-end engineering design to operation — has not only contributed to the BMP's success



but also developed these engineers into industry-leading professionals. This achievement reflects Bapco Refining's firm commitment to supporting local talent and advancing national growth.

The BMP is a pivotal component of Bahrain's energy transition efforts, spearheaded by His Highness Shaikh Nasser bin Hamad Al Khalifa, His Majesty's Representative for Humanitarian Works and Youth Affairs and Chairman of Bapco Energies. It aligns with Bahrain's strategy to achieve sustainable economic growth, enhance global competitiveness, and advance a low-carbon economy. This initiative is set to create quality job opportunities and development programs, reinforcing Bahrain as a preferred destination for foreign investment and a central hub for energy and manufacturing industries.

The BMP includes 21 new process units, 16 new

offsites and utilities units, 22 new substations, and upgrades to 53 existing units; these enhance the Refinery's ability to refine a wider array of crudes and make it more competitive in the global market and aligned with ever-evolving environmental regulations. The BMP has installed over 1,600 piping and electrical/instrumentation cable connections and tie-ins between existing and new facilities to integrate all the assets for enhanced efficiency and optimal operational productivity that leads to enhanced profitability from the refining process within the Bapco Refinery. The BMP has managed interfaces with over 25 different companies and government bodies as part of stakeholder engagement and wayleave activities, and is considered the biggest and most challenging stakeholder engagement and management process to execute this massive investment.

The BMP includes state-of-the-art emergency and control systems to ensure safe operation. Additionally, the Operators Training Simulator (OTS) is a state-of-the-art training simulator, providing high-fidelity customized models that offer the dynamic behavior of new process units within a virtual reality 3D experience. The BMP also introduces scalable wireless infrastructure that is implemented across new units, to communicate process measurements as part of Bapco Refining transformation initiatives.

Key Refinery Process Improvements

- Up to 42% increase in Refinery Capacity
- Up to 400,000 Barrels of Crude per day (new Refinery capacity)
- Up to 110% increase in Naphtha production
- Up to 90% increase in Jet Fuel production
- Up to 72% increase in Ultra-Low Sulphur Diesel production

Key Refinery Environmental Improvements

- 28% improvement in Energy Efficiency Index
- 57% reduction in SO₂ emissions
- 50% reduction in seawater consumed per barrel.
- BMP has installed Emission Monitoring Systems (EMS) on all air point-source emissions which are interfaced and shared with and approved by the Supreme Council for Environment:
 - o Predictive Emission Monitoring System (PEMS) provides predicted emissions using accurate, precise and reliable measurements from different sources on a one-minute frequency based on mathematical models.
 - o Continuous Emission Monitoring System (CEMS) measures emissions on a continuous basis

The BMP's state-of-the-art facilities include:

- New Crude Oil Distillation Unit: processes up to 225,000 Barrels per day, equipped with state-of-the-art heat recovery and salt removal facilities





resulting in significant savings on operating and maintenance costs.

- **New Light Product Treatment Unit:** Using state-of-the-art physical and chemical processes, clean fuel gas, as well as industry-grade LPG and Naphtha, is produced by the BMP to ultimately supply local and global markets with cooking gas and gasoline fuels. Advanced MEROX and saturation processes allow Bapco Refining to produce export-ready LPG for the first time. The production of Naphtha, a key feedstock to the petrochemical industry, will also increase by more than double, paving the way for Bapco Refining's future ventures in the field.
- **VGO Hydrocracker & LC-FINING Hydrocracker:** allow the BMP to increase high-margin product Jet fuel and Diesel to nearly double the current production, using technology available for the first time in the Arabian Gulf and only 1 of 10 constructed globally.

- **New Diesel Hydro-treatment Unit:** Using cutting-edge hydrogen technology to desulfurize, denitrify, and demetallize diesel to produce clean, ultra-low sulphur diesel for customers locally and abroad. The diesel production of Bapco Refining Refinery will nearly double with the BMP, supplying critical automotive infrastructure across several continents.

- **New Jet Fuel Treatment Unit Expansion:** Using the latest improved design and technology, Bapco Refining will nearly double the current Jet Fuel production of the Kingdom. MEROX, electrostatic, and filter processes refine the Jet Fuel to meet the high-quality product expected by our customers.

- **Marine Loading Arm Installation:** The BMP has installed seventeen new robotic marine loading arms. This remote-controlled device allows fast and easy control of loading and unloading activities



with Oil Tanker ships. One marine loading arm can supply 20,000 barrels of refined products per hour, allowing Bapco Refining to provide all Bapco customers with rapid delivery.

The vast scale and span of the BMP includes 200,000,000 Kg of structural steel, 350,000 M3 of concrete, 10,000 Km of cables, 450,000 million of metal welds, as well as 2 million square meters of paint, insulation, and fireproofing. The peak manpower of project personnel was 23,000 workers. The electrical integration within BMP is immense, with 127 electrical transformers installed, 33kV GIS switchgears introduced for the first time, and over 1,500 electrical motors installed, all with high power factor and efficiency. The Bapco Modernization Programme is a cornerstone of the Kingdom of Bahrain's Economic Vision 2030, and meets the targets of increasing

refinery capacity, upgrading the product slate of oil export, and vastly enhancing efficiency.

In the field of Health and Safety Excellence, BMP reached a total of over 256 million manhours by the end of 2024, with an impressive 135+ million hours without a Lost Time Injury (LTI) as of October 2024, a historic milestone reflecting BMP's dedication to health and safety standards.

Additionally, the project has received numerous international recognitions, most recently being awarded the prestigious Five-Star Occupational Health and Safety Audit by the British Safety Council. The BMP is considered the 1st project that has received this prestigious award worldwide. This exceptional accomplishment stands as an example of global best practice in the oil and energy sectors.



Articles



Engineer Saeed Asbool
Member of
Bahrain Society of Engineers



Construction Contract Guarantees

"Construction Contract Securities" are among the tools and requirements that projects' owners utilize to ensure the execution of construction contracts in accordance with the scope of work and specifications outlined in construction tenders. Rarely does a construction contract lack one or more securities that ensure effective performance, structural safety, vocational safety, and the execution of work at the highest levels of quality. Negotiations over "Construction Contract Guarantees" often begin at early stages, sometimes even before the tendering process (in the case of negotiated contracts), and continue until the final completion of the project. Some securities may even extend in duration and effect for years after the project's final completion and entering into the operational phase and beyond.

It has been observed that projects' owners typically take all necessary measures to ensure the effective execution of their projects without encountering failures or setbacks. In addition to specifying standard contract models such as FIDIC, JCT, or others, which are referred to in cases of dispute and include various types of securities, the sets of requirements attached by project's owners to tenders often include additional securities beyond those found in the standard contracts. Project's

owners also attach formats for the guarantees they seek to obtain from contractors, suppliers, and manufacturers, along with a list of approved banks and insurance companies from which the required guarantees are accepted. Furthermore, they grant themselves the authority to determine the level of these securities and the right to seize them without any condition and restriction, particularly those related to performance.



It has also been noted that the "Construction Contract Securities" requested by project owners or project executors vary by type and nature. These include the basic Initial Bond, Performance Bond, Advance Payment Guarantee, insurance policies for individuals and property, third-party liability insurance policies that may be exposed to accidents during project execution, Comprehensive Contractors insurance policies (Contractor All Risk Insurance – "CAR" Insurance), Professional Indemnity insurance policies, and so on. These securities are requested by projects' owners, with each specified as a percentage of the project cost or the portions of the project requiring coverage. While project owners have the upper hand in determining the types of securities and their coverage percentages proportion to the project cost, the securities required for some complex projects are often subject to negotiations among the project stakeholders (project owners, main contractors, subcontractors, appointed contractors) and are mostly challenging. These negotiations

take place before the signing of the construction or consultancy contract.

In industrial projects, project owners often insist on stringent securities in terms of their percentage of the total project value, particularly in the case of retention money (Retention), a type of guarantee where deductions can reach up-to 20% of the project value. This places a significant burden on the main contractor or subcontractors. Project owners are also distinguishing between guarantees required for defects and deficiencies (Lines and Encumbrances Defects) that appear during the defect liability period (DLP) and the long-term guarantees for latent defects that emerge in the structural, mechanical, and other components of the project over longer periods specified by the contract or the laws of the relevant country. Project owners may even become more stringent in demanding guarantees when they insist on conditions requiring contractors to bear the compensating costs for consequential damage resulting from accidents, potentially up to the entire value of the project.



Dr. Bassam Alhamad
University of Bahrain
Chemical Engineering
Department

Optimizing Sustainability in Manufacturing Enterprises: A Sinusoidal Approach to Control Valve Stiction

The study titled "Optimizing Sustainability in Manufacturing Enterprises: A Sinusoidal Approach to Control Valve Stiction" presents a novel method to address the challenges of control valve stiction in industrial processes. Stiction, caused by static friction in control valves, disrupts process stability, increases energy consumption, and raises operational costs. The paper proposes a sinusoidal compensation method to mitigate these effects, offering an energy-efficient, cost-effective, and sustainable solution.

The valve stiction leads to valve oscillations, causing inefficiencies, higher energy usage, frequent maintenance, and process instability. Traditional methods like pulse-based compensation or PI controller tuning reduce stiction but at the expense of increased wear, energy consumption, or steady-state errors.

The proposed solution introduces a sinusoidal compensation method that introduces a non-

aggressive, smooth oscillation to the control input, overcoming static friction without inducing excessive valve wear. It utilizes fundamental frequencies to maintain valve movements, reducing sudden and aggressive adjustments.

The study uses MATLAB simulations with a valve stiction model, applying three compensation methods.

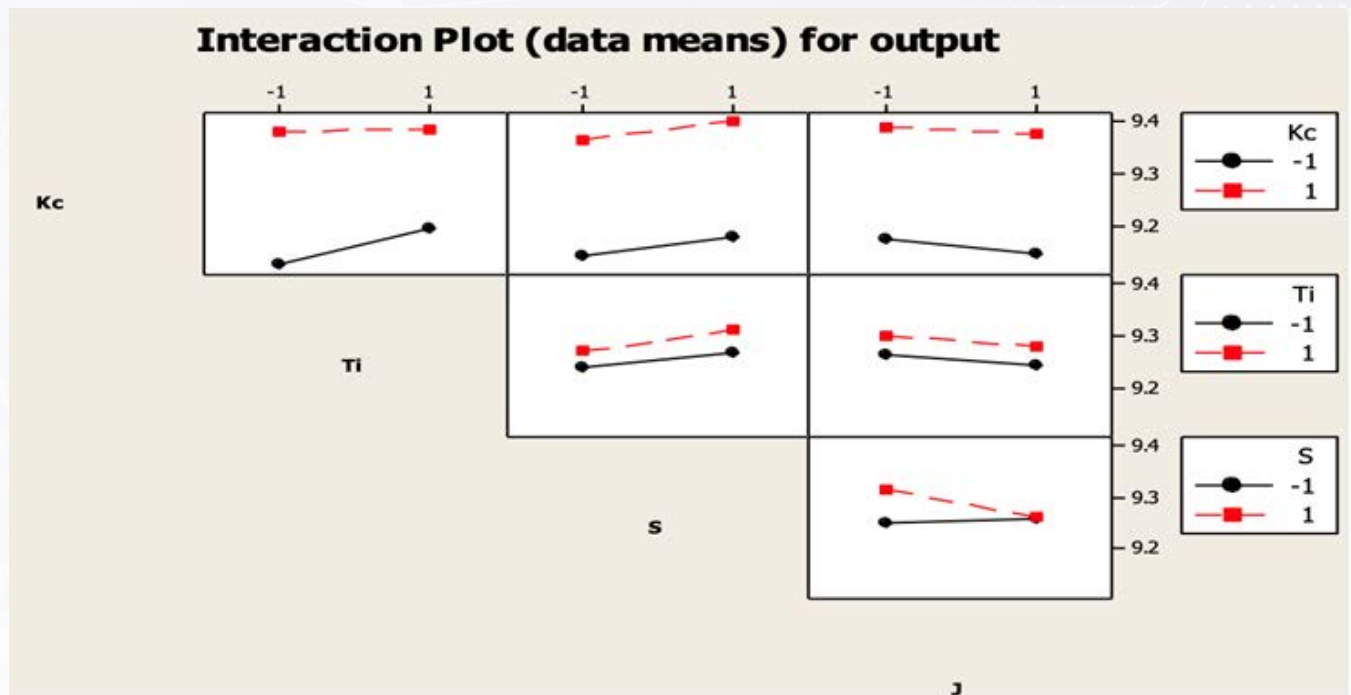


Figure 1: Interaction Plot of the Output

Three methods were used: the pulse method, which showed rapid correction but increased wear; PID tuning, which simplifies implementation but risks steady-state errors. The selected method used sinusoidal method that optimizes energy use, reduces oscillations, and minimizes valve wear.

The results show that the sinusoidal method outperformed the other two methods by reducing oscillations significantly (up to 75% reduction for severe stiction cases). It achieved faster rise times and shorter settling times. It also minimizes

valve movements, which lowers wear and reduces maintenance needs. The energy consumption decreased by up to 30% compared to pulse-based methods. Maintenance wear was cut by over 50%, extending valve lifespan and reducing costs. The method reduced the total operational costs by addressing energy consumption, maintenance, and quality deviations due to process variability.

Great impacts were noticed in cost reduction in terms of smoother valve operation minimizing wear, reducing maintenance costs by up to 40%.

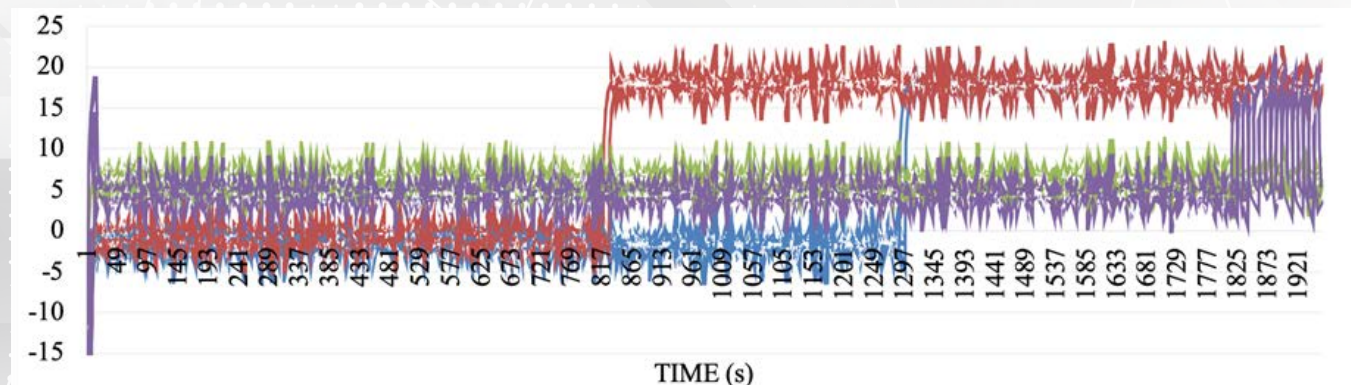


Figure 2: Comparison between the three types of compensation methods ($S=1$, $J=1$)

— Uncompensated, — Compensated (sin), — Compensated (pulse), — Compensated (PID Method)

Metric	Without Compensation	With Compensation
Valve Travel Distance (DD)	0.29 m	0.14 m
Power Requirement (PP)	120.01 W	90.005 W
Energy Consumption (EE)	432.04 kWh	324.02 kWh
Maintenance Wear (WW)	52.2 units	25.2 units
Repair Frequency (RR)	1.04 repairs	0.504 repairs

Table 1: Metric measurement with and without compensation

Energy savings lead to significant cost reductions, particularly in energy-intensive processes. There were also better improved maintenance plans by reducing valve travel distances, decreasing wear and tears, extending equipment lifespan, and minimizing repair frequency. In addition, predictive maintenance schedules were optimized due to more stable operation and reduced sudden failures.

Enhanced Control Stability was obtained by minimizing oscillations; the system becomes more stable, allowing precise control of manufacturing variables like pressure and temperature. Faster

response times improve process reliability and consistency. Better optimization levels were achieved by aligning to the sustainability goals by reducing unnecessary energy consumption and resource waste.

The sinusoidal compensation method offers a sustainable and cost-effective solution for addressing valve stiction in industrial processes. By reducing energy consumption, improving maintenance efficiency, and enhancing control precision, this approach enables manufacturers to optimize operations while meeting environmental and economic goals.

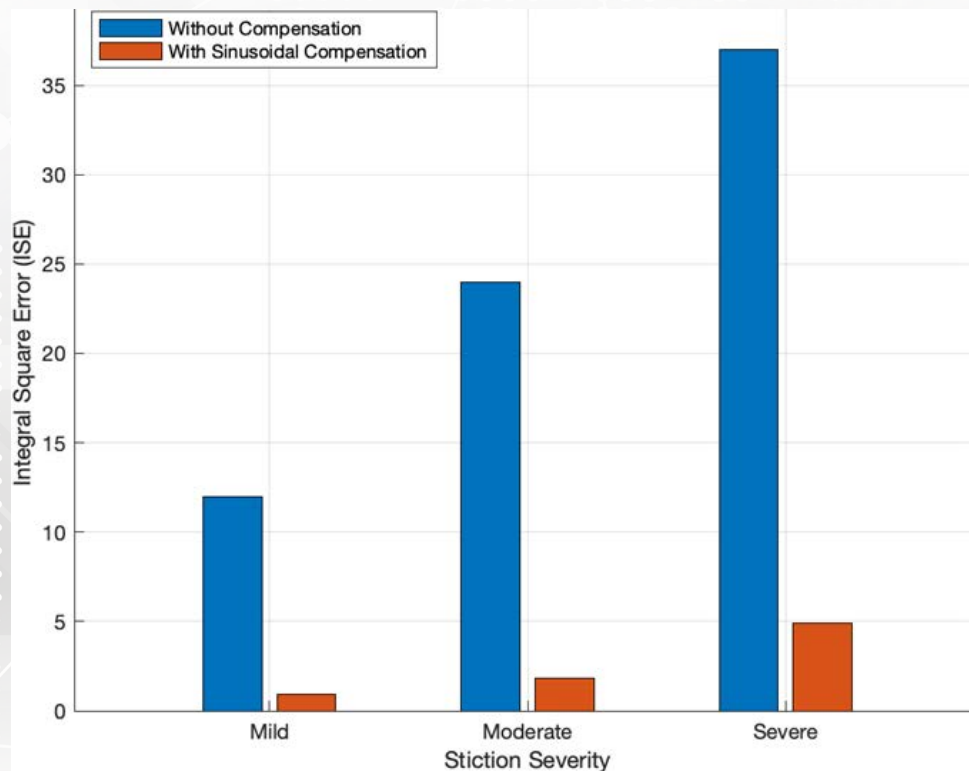


Figure 3: Graph comparing ISE values across different stiction severities with and without sinusoidal compensation.

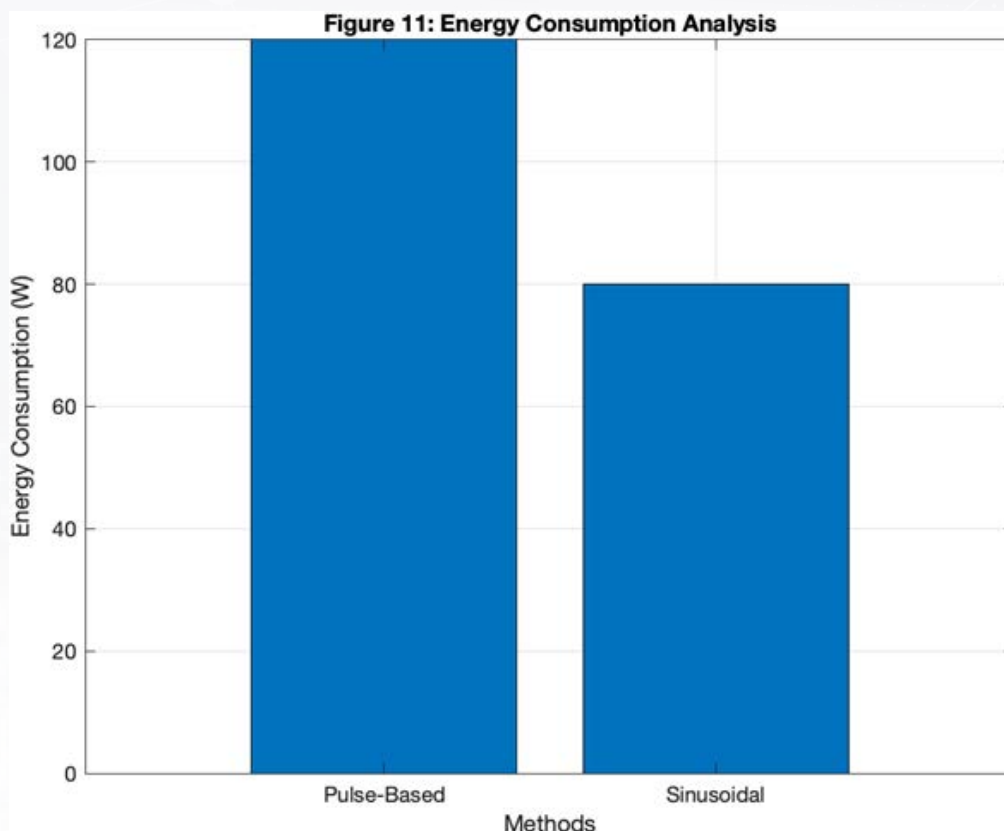


Figure 4: Energy consumption analysis of sinusoidal versus pulse-based methods.

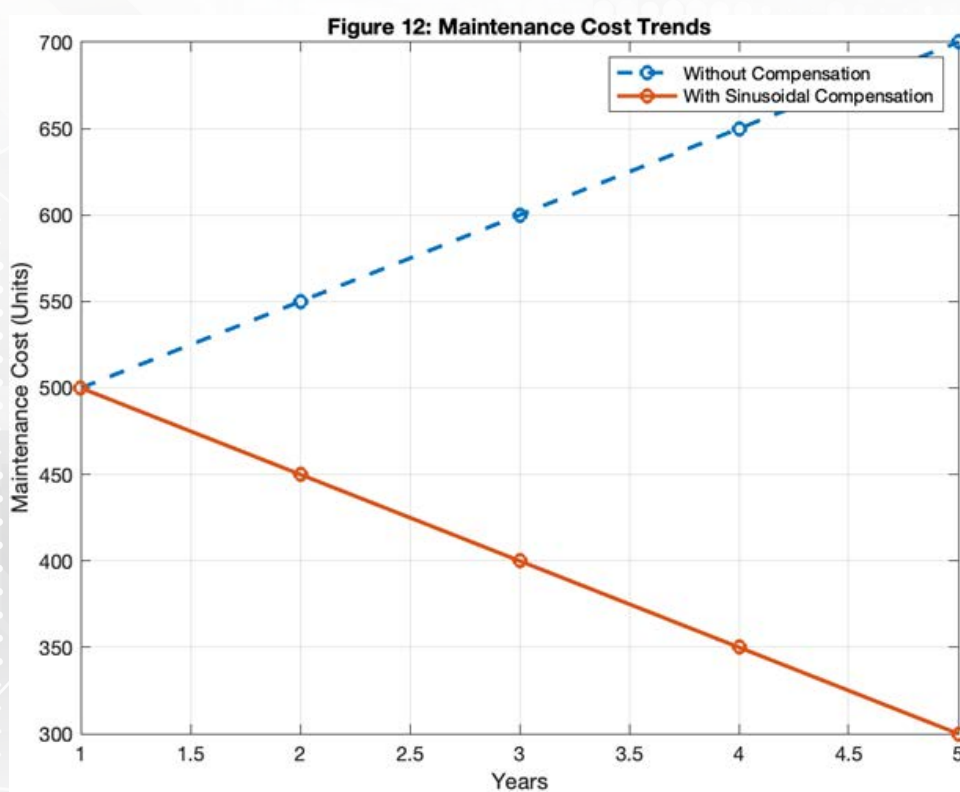


Figure 5: Maintenance cost trends showing reduced wear and extended valve lifespan with sinusoidal compensation

Portrait

Architect Mohamed Helal is considered one of the fundamental pillars of the success and expansion of M Square Design as the Chief Financial and Executive Officer of the company. He leads the operational and financial operations to ensure the highest levels of efficiency and quality in the execution of real estate and commercial projects in the Kingdom of Bahrain and the Kingdom of Saudi Arabia.



Thanks to his strategic vision and innovative approach, he successfully restructured the operational and financial processes within the company, leading to improved performance efficiency, reduced operational costs, and sustainable growth. He has directly contributed to enhancing productivity, increasing profitability, and employing modern technology in design and implementation processes.

Academic Qualifications:

- Bachelor's Degree in Architectural Engineering – University of Bahrain (2015).

His Major Achievements and Contributions:

- Managing and executing residential tower projects and furnishing them according to international quality standards, which contributed to improving interior design efficiency and enhancing the residents' experience.
- Achieving a qualitative leap in the operational efficiency of M Square Design, leading to improved resource management and reduced operational costs.
- Introducing digital transformation techniques in project management, leading to improved execution speed, quality assurance, and enhanced customer experience.
- Strengthening the strategy for financial and investment expansion, helping to increase productivity and achieve sustainable growth in the interior design and furnishing market.
- Supervising the execution of major projects in collaboration with leading real estate developers, contributing to raising the standards of interior design quality and achieving the highest levels of operational efficiency.

Notable Projects He Has Worked On:

In the Kingdom of Bahrain: -Main Talabat Office – Leading the execution process with high operational and financial efficiency.

- Residential and commercial projects in Dilmunia and Bahrain Bay.

In the Kingdom of Saudi Arabia: Architect Mohammed Hilal contributed to the development and implementation of major real estate projects by improving operational efficiency and financial oversight, which enhanced project success and increased their market value. Notable projects include:

- Al-Majdia Residence Projects – Riyadh and Khobar.
- Jewel Jasmine Villas – Al-Yasmin District, Riyadh.



**Architect
Mohamed Helal**
Chief Financial and
Executive Officer,
M Square Design

Portrait

Architect Masooma Groof is considered one of the most prominent names in the field of interior design in the Kingdom of Bahrain and the Kingdom of Saudi Arabia. She has successfully transformed her passion for design into a leading company that offers integrated solutions in design, furnishing, and execution. She founded M Square Design as a small office, and it quickly expanded to become a specialized company with a furniture showroom covering more than 2000 square meters, through which it offers innovative designs that meet local market needs and align with the latest global trends.

In addition to her pioneering role at M Square Design, Engineer Masooma holds a position as a member of the advisory boards at the University of Applied Sciences – the Architectural Engineering Council and the Interior Design Council. She contributes her expertise to the development of academic curricula and enhances the link between education and the labor market, thereby allowing students the opportunity to learn about the latest trends in the world of design.

Academic Qualifications:

- Bachelor's Degree in Architectural Engineering – University of Bahrain (2015).
- Specialized Certificate in Furniture Design and Production – Design Institute in Dubai (2023).

Her Major Achievements and Contributions:

- Development of major real estate projects in the Kingdom of Saudi Arabia and the Kingdom of Bahrain, which helped elevate the quality of interior and architectural designs in collaboration with top real estate developers, providing innovative design visions that suit market needs.
- Establishment of the M Square Furniture Showroom, which has become a main destination for interior design enthusiasts, where seasonal furniture collections reflecting the latest global trends are launched.
- Leading the marketing strategy and digital content for M Square Design by providing analytical and educational content through social media, aimed at raising customer awareness and assisting them in making informed design decisions.

Notable Projects She Has Worked On:

- In the Kingdom of Bahrain:** - Main Talabat Office – Design and implementation of modern headquarters that reflect the brand's identity.
- Residential and commercial projects in Dilmunia and the Bahrain Bay – integrating functionality and aesthetics into comprehensive designs that meet clients' expectations.

- In the Kingdom of Saudi Arabia:** - Al-Majdi Residence Projects – Riyadh and Khobar.
- Jewel Jasmine Villas – Al-Yasmin District, Riyadh.



**Architect
Masooma Groof**

**CEO,
M Square Design**



Projects

Students:

- Hasan Jaffer
- Ahmed Hamza

Supervised by:

Professor Khaled Zehar

Electrical and Electronics
Engineering department,
University of Bahrain

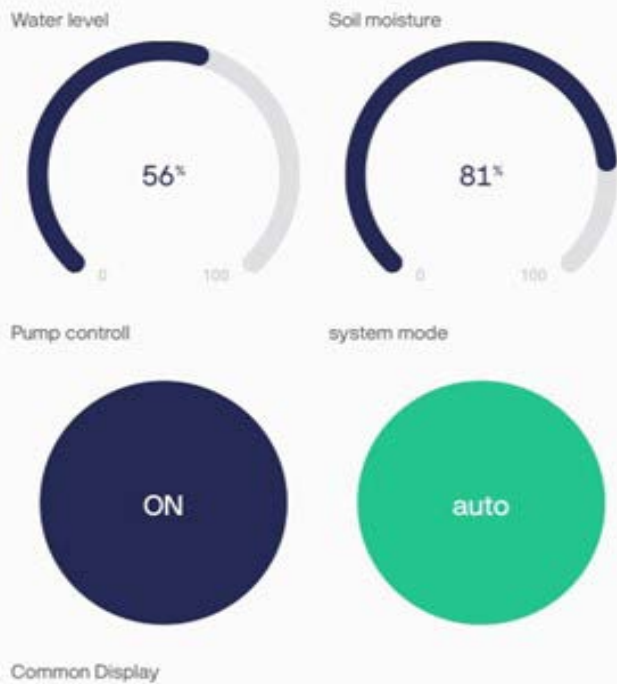
Automatic Irrigation System Generated by Solar

The relationship between desertification, dust spread, and the increase in green spaces and afforestation is an inverse relationship. This study is carried by the students in Electrical and Electronics Engineering department of University of Bahrain Hasan Jaffer and Ahmed Hamza. The project is supervised by Professor Khaled Zehar. The more afforestation, the less dust and environmental impact there is. Because the traditional irrigation process wastes a lot of water and is relatively expensive, in addition to the difficulty of providing it with energy in some places, hence the need for innovative irrigation solutions that reduce environmental impact and

operating costs. This major project offers the design and implementation of a solar-powered irrigation system targeting small and medium-sized farms. The system uses photovoltaic panels to capture solar energy, which is stored in batteries and used to operate a water pump for irrigation. The main components include photovoltaic panels, a battery storage unit, a water pump, and a smart irrigation controller based on a microcontroller.

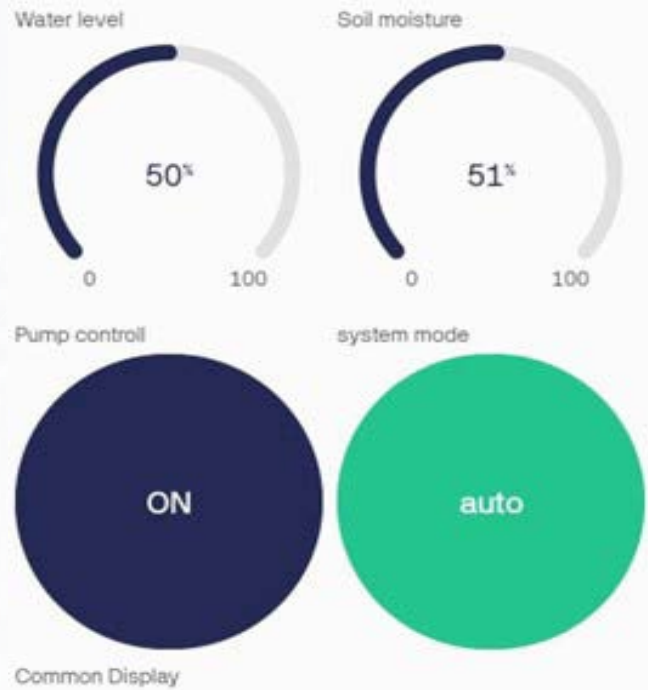
The project included the selection and integration of these components, in addition to developing a control algorithm that uses real-time soil moisture and weather data to optimize water use.

Auto Irrigation System by PV Sola...

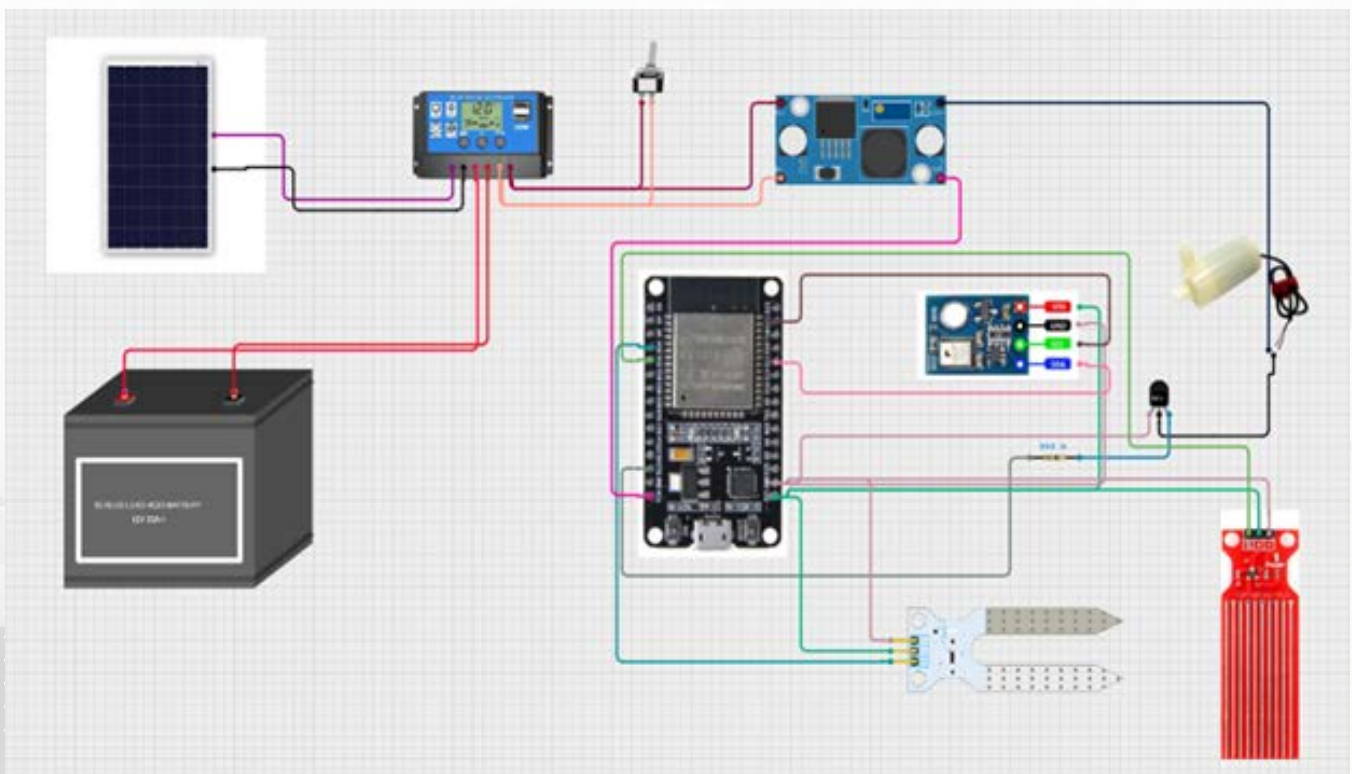


humidity=66.074

Auto Irrigation System By PV S...



pump state=1



The system's performance was evaluated through field tests, where it was proven to be efficient in maintaining appropriate levels of soil moisture while conserving water and reducing reliance on

non-renewable energy sources. Water is pumped in proportion to soil moisture and according to the automation of the system, which conserves resources and avoids wasting them. The results

Projects

Students:

- Hasan A. Ameer
- Mohammed Jasim
- Hasan Ahmed

Supervised by:

Dr. Mohamed Amine Fnaiech

Electrical and Electronics
Engineering department,
University of Bahrain

Transformer Design for Industrial Application of Multiphase Motor: Three-2-six Phases Transformer

Under the supervision of Dr. Mohamed Amine Fnaiech, the three students Hasan A. Ameer, Mohammed Jasim, and Hasan Ahmed. It is known that machines play an indispensable role in our daily lives and cannot be

overlooked under any circumstances. However, phase failure in three-phase motors presents a significant drawback, especially in critical situations such as motor failures in hospitals or industrial settings. This



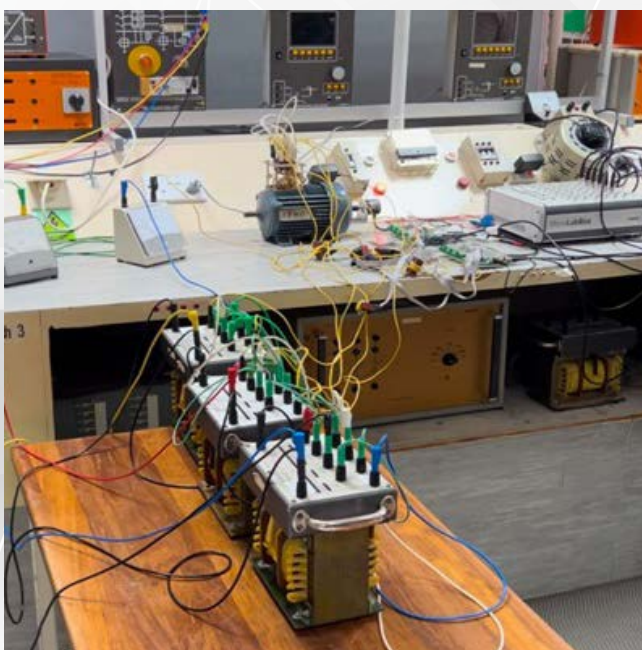
Image of Implementation of the Project



Single phase transformer

is where the advantage of a six-phase source becomes evident. With our method, a six-phase source enables the machine to maintain torque even in the event of a phase failure. In contrast, with a three-phase source, a phase failure causes the remaining two phases to cancel each other out, resulting in zero torque. In our project, we convert three-phase sources into six- and five-phase sources using a winding transformer

MV911 (220:55x4). This approach allowed us to adapt to the equipment available in our lab. We then tested the setup on a six-phase motor to evaluate speed and torque performance under different failure scenarios. we verified the safety and feasibility of running the six-phase motor. This process required significant effort to determine and align the precise phase angles for the six- and five-phase sources.



Cardiovascular and neurological monitoring device



Motor parameter

Projects

Students:

- Ali Salman
- Ali Abdulkarim
- Husain Taleb

Supervised by:

Dr. Ebrahim Abdul-Rahman

Assistant Professor
Department of Electrical &
Electronics Engineering,
University of Bahrain



AI-powered Quadcopter Drone for the Purpose of Lifeguard Assistance in Aquatic Environments

AI-powered quadcopter drone for the purpose of lifeguard assistance in aquatic environments project supervised by Dr. Ebrahim Abdul-Rahman and carried out by three students in the University of Bahrain; Ali Salman, Ali Abdulkarim, and Husain Taleb will focus on the design and implementation of an AI-powered quadcopter drone for the purpose of lifeguard assistance in aquatic environments. Operating as a (FPV) device, our drone is going to use an application that was created using BLINK platform to send emergency notifications to portable devices. Powered by a Pixhawk flight controller connected to a Raspberry Pi, the drone will follow safety protocols maintaining safe altitudes above water, thus preventing potential damage, including Advanced safety mechanisms such as tethering

to protect the hardware from any accidental falls and manual shutdown button for erratic movements.

Using YOLOv10 for real-time instantaneous detection, the AI system will identify obstacles and enhance navigation safety by giving the flight controller specific rules and parameters while maintaining the safety protocols. If the drone detected any drowning incident from its FPV camera it will send an emergency notification on the app thus significantly reducing the

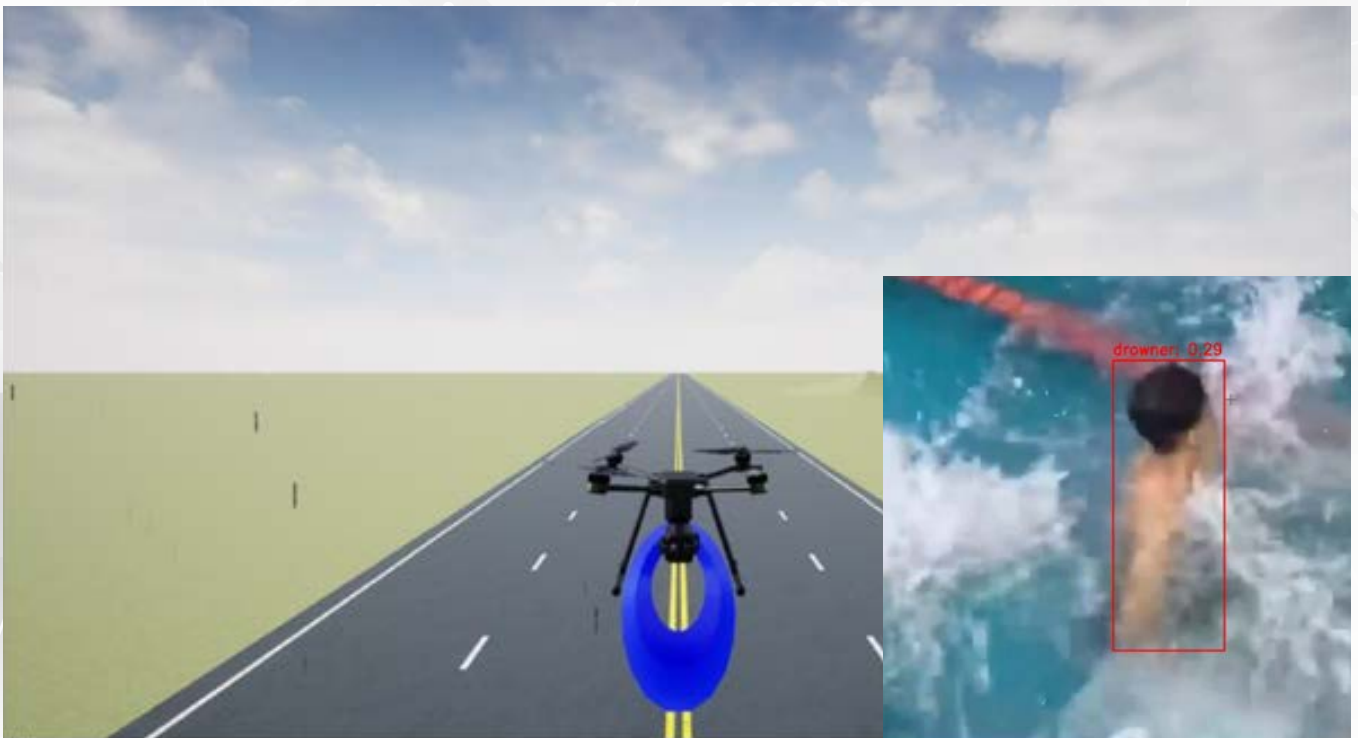




response time needed. Instantaneously the drone will fly to the victim's location deploying a brightly colored flotation tube.

In this report we will explain and show the hardware setup and the initial flight tests will demonstrate

the drone's capabilities, by highlighting the drone's potential to greatly enhance safety measures in water-based recreational areas. Future developments may expand surveillance capabilities and ML techniques to improve detection abilities using other devices.





Projects

Students:

- Yousif Al-Hamad
- Yousif Qadhi

University of Bahrain,
College of IT

Developing a Vex Robot for Autonomous Navigation and Object Retrieval

This project introduces ROBOFETCH, an autonomous robotic system designed to streamline item retrieval processes in indoor environments, such as warehouses, libraries, or retail spaces. The project entitle “Developing a VEX Robot for Autonomous Navigation and Object Retrieval” robot designed by both students Yousif Al-Hamad and Yousif Qadhi from University of Bahrain, College of IT. The core concept behind this project is to develop a robot capable of autonomously navigating through structured spaces, identifying and retrieving specific objects based on color recognition, and delivering them to designated endpoints. This innovation addresses the growing need for automation in environments where efficiency, accuracy, and reliability are crucial for operations.

The robot uses advanced AI vision sensors to detect objects of specific colors—purple, orange, and yellow—allowing it to recognize target items quickly and accurately. Unlike traditional warehouse robots that rely on rotational movement to align with objects, ROBOFETCH features a central wheel that enables omnidirectional movement. This unique design allows the robot to maneuver more effectively in confined spaces, reducing the time and effort needed for object alignment and retrieval.

The system integrates multiple sensors, including distance, gyro, and optical shaft encoders, to ensure precise navigation, obstacle avoidance, and object manipulation. Built using a modular approach with lightweight, durable materials, the robot is capable of handling various warehouse tasks with enhanced speed and accuracy. The software architecture, developed using Python, incorporates AI-driven algorithms that enable real-time decision-making and learning from previous tasks, thereby improving operational efficiency over time.

In practical applications, ROBOFETCH can retrieve items like books from shelves in libraries, specific products from storage units in warehouses, or packages in retail settings, all without human intervention. Future enhancements aim to integrate barcode scanning for more precise identification, improved obstacle detection through additional sensors, and the incorporation of machine learning to optimize its performance in dynamic environments. Ultimately, this project demonstrates how robotics and AI technologies can revolutionize automated retrieval systems, making them more adaptable, efficient, and scalable for various industries.



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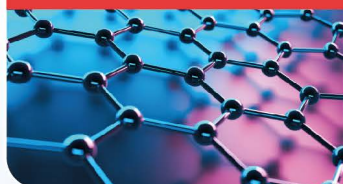
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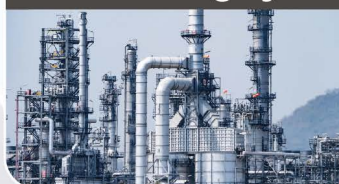
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For more information

T: +973 1781 0733
E: conference.manager@bse.bh
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