Residential Swimming Pool Design with Smart Lighting System

Steve Burns, Pieter-Jon Williams, Shaquille Kerr, Theo Salmon, Amonike Crossdale, Hopeton Irwin
Junior A. Bennett & Shanroy Dennis

School of Engineering, University of Technology, Jamaica

Abstract

Swimming pools can be found at both residential and commercial properties and can be constructed for indoor or outdoor use. Swimming pools are available in a variety of designs and technical specifications based on the customer's preference, the geographical desired location, and budget. In Jamaica, swimming pools are typically seen by some persons as a luxury structure due to the cost of construction and maintenance. The construction of a swimming pool in Jamaica can cost a minimum of $32,000 USD not including maintenance costs. Utility costs can be high, consequently, the pool owner needs to consider renewable energy as a means of supply the electrical energy required. This project aimed to design a swimming pool with electric and water flow systems powered by solar energy and controlled by a smart lighting system in a six-to-eight-week time frame. The swimming pool is designed for a residential area and meets the criteria of Jamaica's building and electrical codes. This project consists of five phases that each depicts information on a category of the pool design, infrastructure, and maintenance plan. The project team conducted in-depth research, calculations, and analysis of current market trends, pricing, and styles. The team consisted of six engineering students across the disciplines of mechanical, electrical, civil, and industrial and two supervisors. Software applications such as Autodesk Revit, Autodesk AutoCAD, Sketchup, and Cx-one were used to create aesthetic designs, structural plans, and electrical systems. Based on the feedback from professional engineers, the design was completed with the use of solar panels, a solar-powered pool pump system, and a smart lighting system. The design of the pool and the powered system is smart, requires low maintenance, and saves energy.

Keywords
Solar Energy, Swimming Pool Design, Smart Lighting and Pool Design, energy conservation

Biographies

Pieter-Jon Williams is currently pursuing a B.Eng. in mechanical engineering in the Faculty of Engineering and Computing at the University of Technology, Jamaica. Before his current studies, he had earned a B.Ed. in TVET – Industrial Technology, Mechanical Technology from the University of Technology, Jamaica. During his time in university, he has been a member of the Rotaract Club and the Call to Lead Jamaica club, where he has spent many hours giving back to the community and helping to change the social development of the adolescence of Jamaica. He has over two years of teaching experience where he taught subjects in the industrial arts and engineering department at the secondary level.

Steve Burns is a final year B. Eng in Electrical Engineering and Computing student at the University of Technology, Jamaica. Before joining UTech Ja, he had completed an Associate in Engineering Technology at Montego Bay Community College. He is currently a contracted engineering intern at Huawei Technologies Jamaica. While attending UTech, Ja was involved in the Chess and IEEE clubs. During his accommodation in the dormitory of Donald Farquharson Hall at UTech Ja, he was an active member of the fundraising, beautification, and religious committees. Steve Burns was awarded Parish Champion of Hanover for the 2018 National Commercial Bank (NCB) Foundation Scholarship based on outstanding academic performance. His group received first place for the Major

Project Poster Competition (2021) at UTech, Ja. The title of the major project was “Real-Time Patient Monitoring System Based on ECG Signals”.

Amonike Crossdale is a final year student of the University of Technology, Jamaica, and electrical drafter at Ngome Ltd. Mr. Crosdale is pursuing a B. Eng in Electrical and Computer Engineering with research interests in artificial intelligence and Automation systems. He completed his major project where he and his group members were tasked to retrofit an obsolete robotic arm. Mr. Crosdale has also participated in interfaculty sports competitions at the University of Technology, Jamaica including interfaculty basketball and football. His team was crowned interfaculty football champions in 2019**.**

Hopeton Irwin is the CEO of Aeroptix, which is a videography/photography brand. This passion has helped him to pave his way through the University of Technology, Jamaica, where he is in his final year of study, pursuing a Bachelor of Engineering Degree in Civil Engineering. He has worked with major corporate entities in Jamaica and has done commercials and music videos. He was a member of the Bowden Harbour Marina design in the year 2020 where he was responsible for the aesthetic and drainage design for the Marina which ended up being one of the top projects that year. Mr. Irwin is currently employed at a Rational Income Fund Company Based in New York.

Shaquille Kerr is a final year student pursuing a B. Eng in Civil Engineering and will be graduating in November 2021. He is a dedicated and self-motivated individual who strives for excellence in everything he does. He was a former dormitory member who had oversight responsibility for entertainment planning and coordination. Mr. Kerr has done work experience at the St James Municipal Corporation and also at the Secrets Resort and Spa as an Engineering Assistant. He has also done a research and design project which was the rehabilitation of the Hope Botanical gardens into a world-class amusement park. His hobbies include investing, watching tv, and spending time with his family.

Theo Salmon is an Engineering student at the University of Technology Jamaica (UTECH). He is pursuing a Bachelor of Engineering in Industrial Engineering. He also became a member of SME while attending UTECH. His research interest includes Safety and Human Factors. Theo’s hobbies include reading and listening to personal development audios.

Junior A. Bennett is an Industrial Engineering Lecturer and Leader of the UTech Ja Productivity Research Group at the University of Technology, Jamaica. He earned a Bachelor of Education in Industrial Technology – Electrical from the University of Technology, Jamaica, and a Master of Science in Manufacturing Engineering Systems from the Western Illinois University. He is the first Jamaican to be certified as a Manufacturing Engineer (CMfgE) by the Society of Manufacturing Engineers (SME). He is credited for the establishment of the UTech Ja Society of Manufacturing Engineering Student Chapter S430 and was a former Faculty Advisor.
He is a former council member and a corporate member of the Jamaica Institution of Engineers (JIE) and represents JIE on the National Commission of Science and Technology. He is a Registered Industrial Engineer with the Professional Engineering Registration Board and a member of IEOM, SME, and IISE. His research interests are productivity improvement, operations research, manufacturing, Industry 4.0, and quality control management.

Shanroy Dennis is a Mechanical Engineering Lecturer and Researcher in the Faculty of Engineering and Computing at the University of Technology Jamaica. He earned both a Master of Science in Renewable Energy Engineering and a Bachelor of Engineering in Mechanical Engineering from the University of Technology, Jamaica. He was the recipient of the Jamaica Institution of Engineers’ Award for being the Most Outstanding Engineering graduate from the University of Technology, Jamaica in 2017. He is a certified Agile Project manager. His current research interests span across process optimization, renewable energy, and energy management. He is currently the academic Advisor for the UTech Ja Society of Manufacturing Engineering Student Chapter and a Director in the Rotaract Club of Liguanea Plains in St. Andrew Jamaica. He has professional membership in the Jamaica Institution of Engineers (JIE) and the Society of Manufacturing Engineers (SME). Mr. Dennis was one of two Jamaican’s

selected to take part in the Diehl Metering Graduate Internship in Germany for two months in 2019, the programme was a success.