E-Rain Smart Storm Water Inlets Gate

The GREEN MANAGEMENT for Smart Cities Roads Drain Rain System

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Abstract

The emergence of Industry 4.0 forces us to become people who continue to advance and are technology literate, and Multidisciplinary engineering fields such as mechatronics combine engineering specialities such as robotics, computer science, product and here (our New Invented Category) (Civilectronics) is the combination of Civil engineering, Electronic engineering, Computer engineering, Control engineering and Systems Design engineering in order to the Electronically Control of Civil Works for Infrastructure Maintenance and Operation (Civilectronics) just included the combination between Civil (Infrastructure O&M) and electronics; hence the word is only a part of Civil and electronics.

The world is witnessing rapid developments in information and technologies different, it has become of electronic systems a strong influence and direct the knowledge society, where control of the individual and society, which uses information technology tools and communication technologies that allow the building of knowledge, control, increase protectively, accurate result and quality of life, being environmentally friendly (Green Management), and a giant of the technology as we know is the computer and covered by the programs and the characteristics of Informatics. The Computer & Computer Program can playing big roles in our lives, But it can be used for a lot of benefits work to controlling, Admin our Life and save money, by using the Computer Program

The Smart infrastructure Cities and Sustainable Regions by exploits innovative regional development concepts, the key to which is the integrate Electronic control and data transfer e- civil engineering to become a civil works more accuracy, control and abundant data and information. To extent of turning the concept of maintenance and operation of infrastructure through the normal civil works to work of a civil electronically controlled. It is new Engineering Technology called (Civilectronics)

This Technology for Electronically Control of Civil Works to improvement the Infrastructure Maintenance and Operation (Storm water O&M) and increase protectively, accurate result and better quality of life, being environmentally friendly (Green Management).: Recognizes a venture of green management, method that add valuable experience for saving environment and ecosystem

This integrative approach is of vital importance for success and the simultaneous creation of socio-economic and ecological sustainability.

We Deliver Innovative Solutions for Complex Storm Water Problems and flooding on the roads and the Role of Environmental Technology Invention in Smart infrastructure Cities (Green Management Invention):

1. Introduction

In this regard I will explain one of my innovation in field of maintenance and operation to show how important the role of computer programs and networks in the community and our lives, and to highlight the role of information technology and networking programs in the transition to a knowledge society through employment and the application of information technology and connect them with geographic information systems (GIS) – (CMMS), so that can follow up and control by networks control:

An invention enters the system electronic control in the civil works and could be called a (Civilectronics) and its definition simply is to integrate control and data transfer e- civil engineering to become a civil works more accuracy, control and abundant data and information. This invention can build a new concept (New Category) on extent of turning the concept of maintenance and operation of infrastructure through the normal civil works to work of a civil electronically controlled.

Long before everything turned smart entrepreneur, we devised a way to make road rain drainage systems smarter. In the time of technological advancements, that is ages ago.

Smart infrastructure has succeeded by supporting smart city, in distinguishing itself as a world leader in providing intelligent living opportunities. In E-Rain Smart Storm Water Inlets Gate have devised a way to make road drainage systems smarter.

The primary idea being to create smart gates for storm water inlets that are sensitive to water/rain and open and close automatically when required. What this does is restrict sand from flooding these inlets during or before rain. It also has an added feature of electronic maintenance which checks the sand level or percentage in the inlets eliminating the chance of lengthy the manual labour or faulty assessment of these inlets. E-Rain Smart Gate.

But overall, there are many more advantages to E-Rain Smart Gate than just its practical use.

- It stops sand and other elements from blocking the inlets which lead to flooding on the streets.
- It reduces manual labor and mistakes when it comes to maintenance of these Inlets.
- It leads to a smart way of road management, where regular checks can be made with just the click of a mouse.
- It blocks the water drainage system from becoming as escape route for potential criminals.

2. VALUE PROPOSITION AND ALIGNMENT WITH INFRA CHALLENGE:

We are currently facing a triple environmental crisis (climate change, biodiversity loss & pollution) and feel the need to “make peace with nature”.

The transformation of our productive systems will allow us to develop a “New Nature Economy” capable of facing this crisis through three main blocks of action: infrastructure system, raw materials system and food system.

E-Rain Gate is part of this global solution, included in any resilient infrastructure toolbox with the following macro benefits for the three production systems (or main blocks of action):

- **Climate Change Fighter:** avoiding the effects of torrential rains in cities.
- **Resilient Agent:** reinforcing existing infrastructure
- **Technology Enabler:** spreading its innovative approach to other connected city assets.
- **Synergy generator:** by integrating city systems to recover sand, we contribute to water savings and energy production.

E-Rain Gates is a smart solution to flooding. The solution solves complex drainage problems without direct human intervention. This is enabled by creating smart gates for rain-sensitive stormwater grates with proven electronic maintenance, thus reducing not only manual labor but also flooding in cities that are prone to stormwater problems by (Figure 1):

- Preventing sand and other elements from clogging drains that cause street flooding. (**Public benefits**)
- Reducing manual labor and mistakes in sewer maintenance. (**Human benefits**)
- Leading to an intelligent form of street management, where periodic checks can be performed at the click of a mouse. (**Government benefits**)
- **Technologies are using:** Artificial Intelligence / Next-generation Information Technology (Big Data analysis , IOT, Network Information and Equipment)

Figure 1 Project Problems / infrastructure toolbox

3. The Role of Environmental Technology Invention in Smart infrastructure Cities (Green Management Invention) (Figure 2):

- This invention is particularly useful in tropical countries where torrential rains are common, or desert countries where wind distributes a sand before rains (Gulf countries), where it reduces the risk of environmental damage by floods.
- The Governments pay a lot of money for maintenance storm water Inlet without 100% perfect result to leads the rainwater accumulating and still in the street then lead to flood.
- Save more than 60% for normal maintenance cost for Government (By Control management and pay only for storm water inlet which selected it and must need it for Maintenance)
- It will be protecting the public from the (hindering traffic, Accidents, flooding & Sliding asphalt) because (As we know before any raining, preceded sandstorm). The sand entry in the drainage of rain or filled in it, lead to the accumulation of rainwater in the street outside the storm water Inlet
- The Fraud in periodic maintenance and relying on manual maintenance incorrect information (incorrect drawing with showing the incorrect number and place of inlet in the storm water Inlet leads to accumulating of rainwater in the street then lead to flood.
- It can be solve (Without direct human intervention (E-Government)) by the electronically maintenance work by measuring the percentage of sand in the storm water Inlet inside (electronically) and Prevent the entry of sand in the storm water drainage by Automatically Smart Gates (It is New Innovation to improvement the Infrastructure Maintenance and Operation (Storm water O&M) and increase protectively, accurate result and quality of life, being environmentally friendly (Green Management).

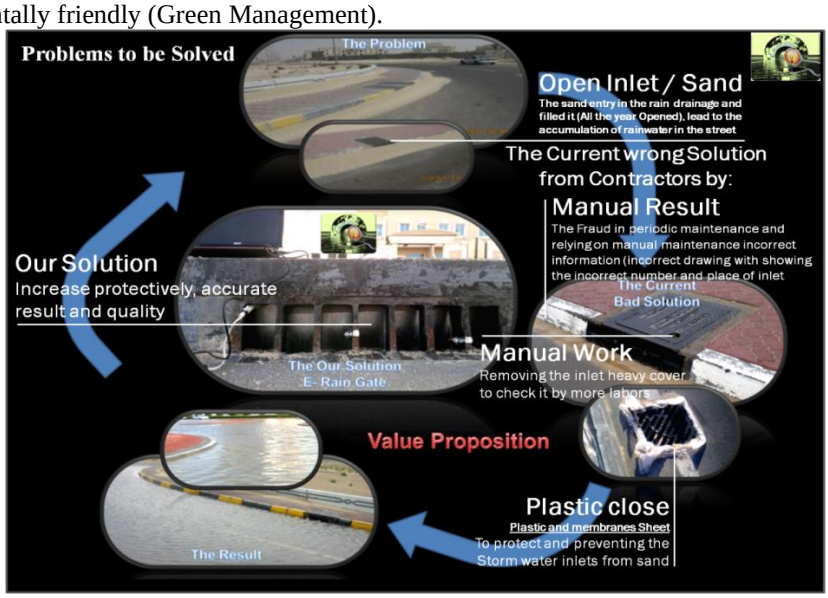

Figure 2 Project Problems Solved

4. **Without direct human intervention and by the electronically maintenance work by measuring the percentage of sand in the storm water Inlet inside (electronically) and Prevent the entry of sand in the storm water drainage by Automatically Smart Gates (Figure 3 &4):**

3. 1.(Automatically Smart Gates for Storm water Inlets (Open & Close) on rain time by (Water sensor) to Prevent the entry of sand in the drainage of rain or filled in it, leading to the accumulation of rainwater in the street outside the storm water Inlet

3. 2. With Electronic Maintenance by (Distance sensor) to clarify the proportion of the amount of sand inside the inlets without (removing the inlet cover or check it) the invention is particularly useful in tropical countries (torrential rains are common), or desert countries (wind distributed sand before rains), it reduces the risk of environmental damage by floods

Figure 3 Project Structure (Hard & Software)

3. 3. Maintenance Program Details:

- Check the work of the Automatic Gates and battery charge.
- Order the (Distance sensor) to work and clarify the proportion of sand amount inside the inlets
- Data analysis for the percentage of sand inside the inlets as was sent it from (Distance sensor) (if sand amount Low = will required Labor to remove it) (if sand amount High = will required Combination Tanker to remove it)
- Showing the percentage of sand by number and place of inlet with time maintenance
- Check in the storm water Inlet electronically and Mark on drawing program (Without any manual deception using drawing)

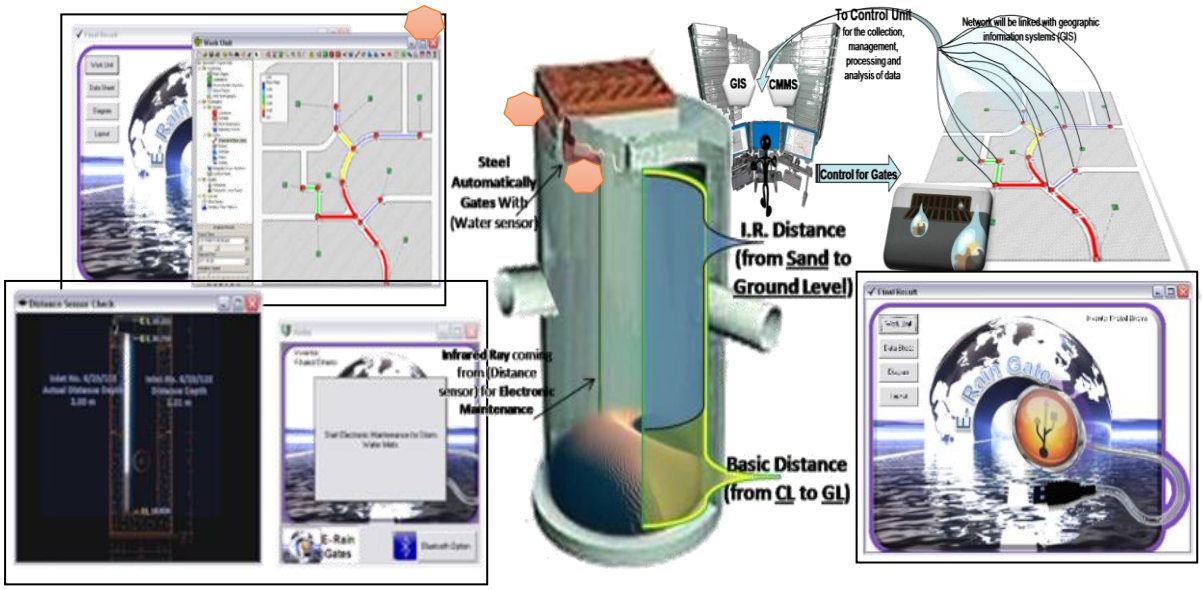

Figure 4 Project Structure (Hard & Software)

5. The technology benefits end users, as an overall solution that is part of any resilient infrastructure toolbox:

- Economical: It will save governments and municipalities more than 65% of the cost of normal grates maintenance, and it will also strengthen them through increased protection, accurate performance and high quality.
- Environmental: As a climate change fighter, this new technology is particularly useful in tropical countries where torrential rains are common, or desert countries where the wind distributes large amounts of sand before it rains (e.g. Gulf countries). In these places, the risk of environmental damage caused by flooding is reduced with E-Rain Gate.
- Social and human: Reduces manual labor and errors in the maintenance of these sewer grates. It all leads to an intelligent form of road operation and maintenance management (O&M) for Smart Cities and sustainable regions by exploiting innovative concepts of regional development, consisting of integrating electronic control and data transfer.

6. LEARNING FROM THE PROJECT AND PLANNING FURTHER DEVELOPMENT (Figure 5)::

- Although there are Smart solutions still used the Current wrong Solution from Contractors by plastic and membranes Sheet to protect and preventing the Storm water inlets from sand, but it are leads to the accumulation of rainwater in the street outside the storm water Inlet:
- It is proposed is to introduce a radical improvement in the form of Maintenance and Operation for (Storm water O&M) to be a Green Management: Recognizes a venture of green management, method that adds valuable experience for saving environment and ecosystem:
- The development of smart cities not only Depends to e-development solutions, we searched for an alternative of physical / chemical to be less costly and sustainable technology to accommodate all Governments levels Materialist
- Half automatically device (manual) (By cable USB Inlet connected with (Scale distance) Alternative of (Distance sensor) & same Gate with (PVA technology) Alternative of (electronic water sensor) (Medium result but require more work)
- If this invention considered more expensive than normal way, then it could not be installed in all storm water inlets. There are areas called (Wet Spot) and These areas are the areas of water accumulation are caused by (differences in terrain or defects in asphalt for roads) leading to the existence of these points of water accumulation (Wet Spot), that is originally specific points from maintenance and operation section, about that will be installed this invention gates only in the inlets around this points (Wet Spot), where to complement the role of storm water inlets because these inlets are unable to end their role when fullness of sand and dirt, after that become worthless and this invention will play a big role in this to completed it.

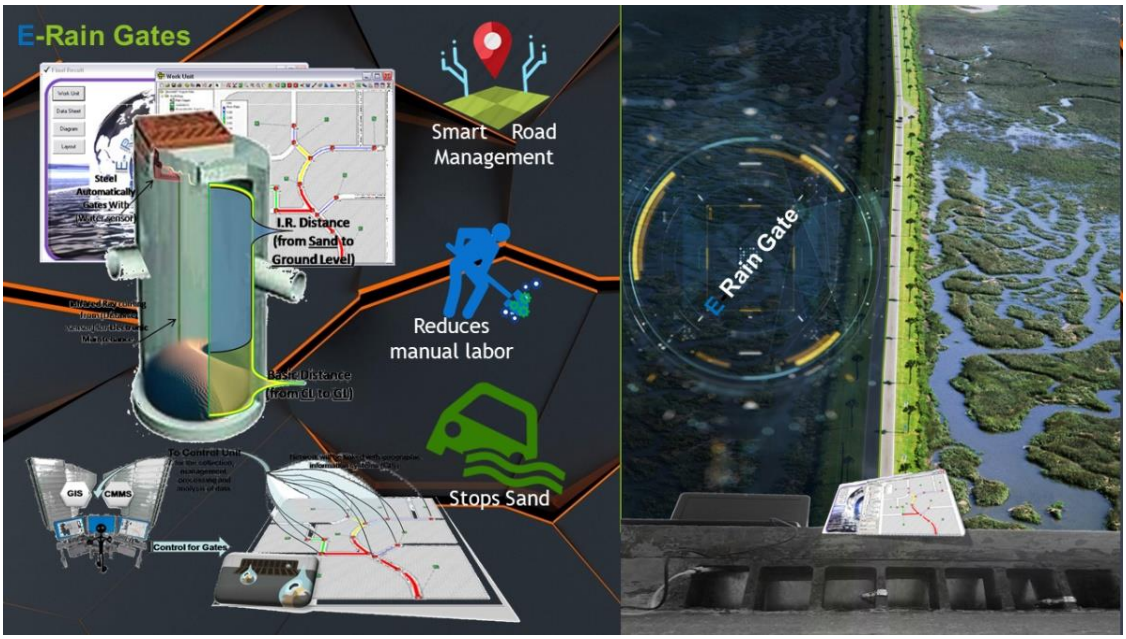

Figure 5 Project Structure (Toolbox)

7. The current state to develop this idea (Figure 6):

- The mechanism of supporting innovations and organizations involved by companies work with Operation & maintenance municipality to (manufacturing, fixed and maintenance it) As we already Applied a real prototype to rainwater drainage exits to show the effectiveness of the device in U.A.E., Abu Dhabi ((Khalifa B) Shakhbout City) Developed a prototype under Abu Dhabi Technology Development Committee (INNOVATOR 2014).
- Patented (Hard & Software)
- Connects to possible practical applications by Joint Cooperation (application and implementation) with a lot of Department: •The Swedish Inventors' Association Foundation/ •Masdar Company(U.A.E.) / •Dubai Technology Entrepreneurship Centre (U.A.E.) / • The Ajman University Innovation Center (AUIC) (U.A.E.) / • The Egyptian Engineering Authority of the Armed Forces
- Establish Web Site: www.e-rain-gate.wixsite.com/e-rain-gate
- Proved the Social Acceptability of this Proposal by taken International Awards and good examples of practice from a lot of International Innovations conferences & Exhibitions with The Best Practice Awards in the Personal Award Category (Ref. No.ARE455-14) (Civilectronics) in the DIABP International Award from the (Dubai Municipality & UN) and The Best Environment Tech Startup Awards from The Ajman University Innovation Center (AUIC) (Idea Competition 2019).
- The **social acceptability** of this approach has been proved through International Awards and good practice examples, as well as 70 medals (with internationally approved innovation certificates) have been won at numerous international innovation conferences and exhibitions (30 countries worldwide) Win 70 Nos. of International Innovation Medals (47 Gold, 16 Silver & 6 Bronze) with 80 Nos. of International Innovation Certificates, the Legion of Honor, Special Award, 4Nos.of the Outstanding International Diplomas and adopted & published internationally in more than 20Nos. of international engineering conferences (Sweden, Taiwan, Malaysia, Romania, Russia, Kuwait, Korea, Ukraine, U.K., China, Egypt, Morocco, Iran, Italy, Hong Kong, Poland, Thailand, Belgrade, Zagreb, Mongolia, Croatia, Indonesia, India, Czech, Bahrain, Turkey ,U.A.E. and Bulgaria)

Figure 6 The current state development

8. The Developmnet & Progress of Project:

Since we Applied Real Prototype: into one of a rainwater drainage exit to show the effectiveness of the device in U.A.E., Abu Dhabi (Shakhbout City) on 2012

Work has begun to enable the project by coding the rainwater drainage entrances (QR Code and Barcode), where it is easy to know the location of (Inlets) also the details of drainage (Inlets) in terms of depth (Invert Level, Cover Level & Ground Level) it will be help facilitate the project task and the calculation of sand quantities in (Inlets)

Figure 7 The Developmnet & Progress of Project

9. The ORGANIZATIONS BENEFIT:

Involved by companies work with Operation & maintenance municipality (Government) to (manufacturing, fixed and maintenance it) and Selling and training this New Application to apply it (Hard & Software)

Involved by institutions: Creation a New Engineers & technicians (Civil / Electronic) regarding this New Engineering Technology (Civilectronics) into New Application to apply it (Hard & Software) to integrate Electronic control and data transfer e- civil engineering to become a civil works more accuracy, control and abundant data and information. To extent of turning the concept of maintenance and operation of infrastructure through the normal civil works to work of a civil electronically controlled.

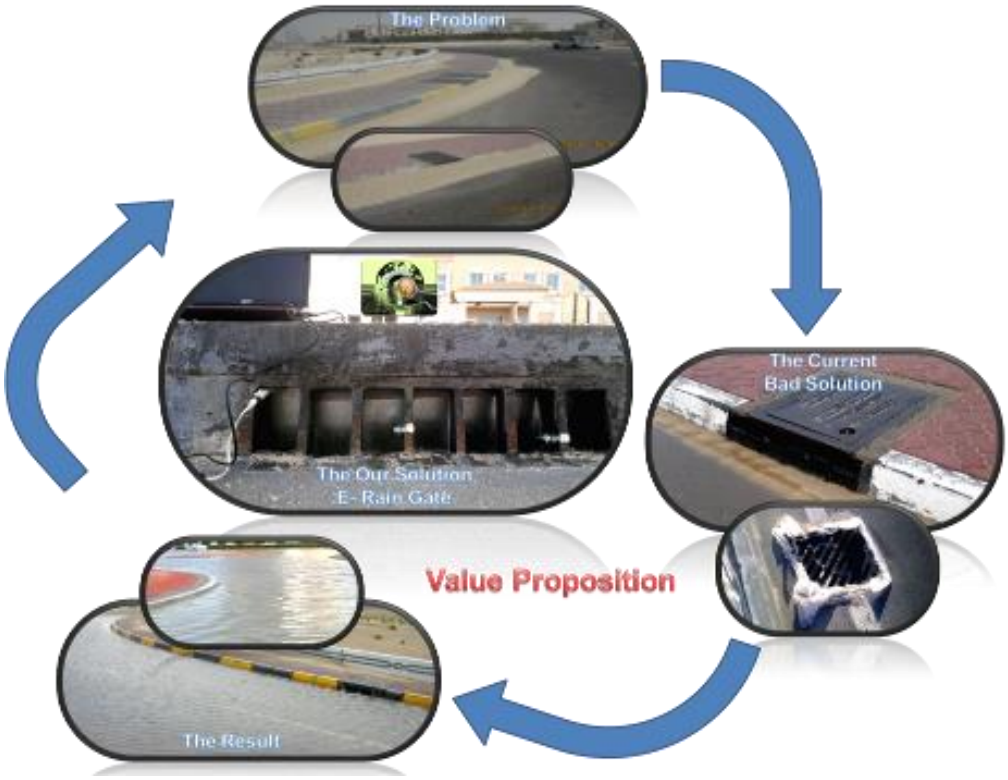

Figure 8 The Value Proposition (Current wrong Solution)

10. LONGER TERM BENEFITS:

- Using the evaluation of the strategy of flexibility on this new Technology (E-O&M Storm water), we are the pioneers for all countries in the development of this technology, there is little likelihood that a competitor and get us out of the market
- Leading Company in production and fixing of Electronically Infrastructure Maintenance and Operation control (Storm Water O&M) at the international level of Type to accommodate all Governments level.
- THE INNOVATIVE: We developing the project to protect and be more controlling the storm water network form Sand by two ways Gates (with water sensor) (Distance sensor) monitoring by controlling program to reduce money and effort
- Our vision is to continue developing and researching that improve this environmentally friendly Technology. We have a product with which we can influence the market with high growth potential by investing in training, research, innovation and constant development without affecting the environment.
- About that because this a New Technology (Partners are afraid to support it, but we have multiple solutions to keep up with all the slides Government (from the rich government up to poor government)

11. The solution is unique as provide innovative smart solutions for complex stormwater and roadway flooding problems by:

- Environmental technology intervention in sustainable smart infrastructure cities.
- Reduction of manual labor and errors in the maintenance
- Prevention, mitigation or transfer of a potential risk such as the accumulation of rainwater on the road, with the consequent obstruction of traffic, accidents, flooding and asphalt slippage
- Empowering governments with perfect output and control, saving more than 60% of the normal maintenance cost to the government.
- No direct human intervention with the use of data to avoid faulty assessment.
- Unique selling point - Countries generally have rainwater drainage networks. However, in those countries where sandstorms occur (e.g. Gulf countries), as well as tropical countries with torrential rains and desert countries where the wind distributes sand before it rains, these rainwater drainage networks are not sufficient. It is precisely in these countries that E-Rain Gate would be particularly useful.
- There is currently no similar or homologous product on the market, so there are no competitors for the project's products on the market. We differentiate ourselves because we use intelligent technology for the electronic control of infrastructure (O&M) of civil works.

Figure 9 Project (Smart solutions for complex stormwater)

12. Summaries

This Research interested in global (Gulf Area) Environmental to issues the dynamics of innovations and environment and provides a platform to assess the changes in environmental models and the paradigm shifts to ensure better quality of life:

- Green economy initiatives for smart future by Smart solutions for combatting climate change
- Innovative environmental technologies for Quality assurance in environmental management.

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4. Establish Web Site: WWW.e-rain-gate.wixsite.com/e-rain-gate

5. **Thesis Research in the International Innovation Scientific & Engineering Conference:**
On 2019 / 2020:
- Thesis Research & participation in (The Innovation Arabia 13) Conference under Hamdan bin Mohammed Smart University (HBMSU) Title: (**E-Rain Gates SMART GATES FOR STORM WATER INLETS sensitive to Rain Innovative Solutions for Complex Road Stormwater**)) Abstract Topic: **Smart Cities**

On 2018:
- Thesis Research & participation in (OMAINTEC 2018) INTERNATIONAL OPERATIONS & MAINTENANCE CONFERENCE IN THE ARAB COUNTRIES Title: (E-Rain Smart Storm Water Inlets Gate) (The GREEN MANAGEMENT for Smart Cities Roads Drain Rain System))

On 2017:
- Thesis Research & participation in (The 3rd World Congress on Infrastructure Asset Management 2017) in SELANGOR, MALAYSIA (Paper ID: INFRAASSETS3: 011-003) Title: (E-Rain Smart Storm Water Inlets Gate (The GREEN MANAGEMENT for Smart Cities Roads Drain Rain System))

On 2016:
- Thesis Research & participation in The (IMA World Maintenance Forum 2016) International Conference on the IMA World Maintenance Forum in Lugano, Switzerland Subject it: (Civilelectronics) http://www.imaworldforum.net/index.php/Programme.pdf
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On 2015:

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