جامعة الإمام عبدالرحمن بن فيصل
IMAM ABDULRAHMAN BIN FAISAL UNIVERSITY
College of Engineering كلية الهندسة

Department of Environmental Engineering

Senior Design Projects

2018- 1439

Poster Presentation Day

April 19 - 2018, Building A13 (10:00 AM to 2 PM)

جامعة الإمام عبدالرحمن بن فيصل
IMAM ABDULRAHMAN BIN FAISAL UNIVERSITY

Environmental Engineering Department **Senior Design Project**
College of Engineering **(2nd Semester – 2017-2018 Session)**

Design of Air Gap Membrane Distillation for Water Desalination

Students: Hassan Abdrabalrasool Alsadik; Marwan Mohammed Balharth,;Mostafa Mansour Alramadan

Supervisor: Dr. Habis AlZoubi; Dr. Fahad Alamri

Abstract

There is a growing demand for access to safe water sources, for both domestic and industrial use. The abundant availability of seawater makes technology for desalination processes increasingly desirable. Membrane technology is well recognized as the most convenient desalination technology. Among these processes, one can find air gap membrane distillation (AGMD) process that is applied also in desalination of seawater and brackish waters. MD is defined as a thermally driven process, in which only vapor molecules are transported through hydrophobic membranes. The driving force for the process is the trans-membrane vapor pressure difference, depending also on the temperature difference across the membrane. In AGMD, Stagnant air is introduced between the membrane and the condensation surface. The vapor crosses the air gap to condense over the cold surface inside the membrane cell. In this project, a design of AGMD system at Lab level for water desalination will be conducted. Moreover, different parameter such as feed temperature & flow rate, coolant temperature & flow rate, and feed concentration will be studied, and their effects on the performance of the AGMD system will be covered. Finally, a mathematical model for AGMD process including heat and mass transfer will also be investigated.

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Environmental Engineering Department **Senior Design Project**
College of Engineering **(2nd Semester – 2017-2018 Session)**

Development of Computational Design Engine for Wastewater Treatment Units

Students: Ahmad Mohammed-Abdullah Alkousa, Mohammad Abdulaziz Al-Nafisa, Waleed Talal Al-Afif ,

Supervisors: Prof. Isam Abdel-Magid; Dr.Eng. Hisham I. M. Abdel-Magid

ABSTRACT

Engineering wastewater treatment plant design and its related units may be carried out manually or using pre-prepared design programs and software. Manual design is lengthy and time consuming. Available design programs usually are either costly or of restricted use. This project aims to develop an easy-to-use, simple, user-friendly and expandable calculation engine in the form of generating detailed spread-sheets to enable design of wastewater treatment units and components. In this regard, Microsoft Excel® was adopted in this research work for its capabilities of incorporating simple on-cell line formulas with embedded code-recording Macros; alongside more advanced programming by utilising VisualBasic for Applications (VBA) under MS-Excel. Design procedure and steps are set for each unit individually depending on input data parameters, governing design factors and related limitations. Detailed information and authenticated sources of wastewater, characteristics and influential parameters that are critical in the design stages and procedures are showcased to appeal the achievability of this research work. British codes of practice and design rules were adhered to in design calculations, plant performance and efficiency as well as operation analysis. The formulated calculation engines were tested and verified against both arithmetic and logical errors; by means of respective manual calculation follow-up and logical algorithms & flowchart representations. The final product is manifested with lexical explanations and screenshots of different software interfaces. Additionally, calculation output sheets were presented in their final reporting format.

Efforts done in this research work paves the road for further development and enhancement of the currently modelled wastewater treatment units and enables addition of more WWTUs.

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Environmental Engineering Department **Senior Design Project**
College of Engineering **(2nd Semester – 2017-2018 Session)**

DESIGNING AIR POLLUION CONTROL STRATEGIES FOR INDUSTRIAL EMISSION AT DAMMAM: EMISSION INVENTORY, DISPERSION MODELLING, AND HUMAN HEALTH RISK ASSESSMENT APPROACH

Students: ABDULRAHMAN ALQAHTANI, ABDULLAH ALGHAMDI and FOUAD ALMUAIWEED

Supervisors: Prof. Omer Aga, Dr. Ismail Anil

ABSTRACT

First industrial city in Dammam suffers from extreme pollution emissions that effect on the Air Quality and threaten the environment and public health. Many studies found out that the major pollutants are CO_2, $PM_{2.5}$, PM_{10}, SO_x, CO, and NO_x. This research study approach to find a sustainable solution that can control the emissions based on those pollutants analysis. AERMOD model is one of the dispersion modeling that is used for atmospheric dispersion of industrial emissions.

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Environmental Engineering Department **Senior Design Project**
College of Engineering **(2nd Semester – 2017-2018 Session)**

Multi-criteria Design of Sanitary Landfill for Dammam Metropolis

Students: Abdulaziz Albarjas; Abdullah Alessa ; Mohammed Saeed

Supervisors: Dr. Nuhu Dalhat Mu'azu; Dr. Nawaf Blaisi

Solid waste generation in Dammam metropolis has been dramatically increasing due to intense increase in population, industrial activities as well as rapid urbanization. This has been a major concern to Dammam Municipality due to the health problems associated with improper disposal of solid wastes. Thus, landfill as the most common waste disposal of different types of solid waste, proper designing of landfill is paramount towards ensuring safe disposal of solid wastes to ensure adequate management practices to meet emerging environmental regulations. However, several aspects need to be taken into cognizance in getting suitable location as well as appropriate design for a landfill in order to ensure meeting environmental regulatory requirements and optimal serviceability for cost-effectiveness. This project presents a design for a sanitary landfill to cater for municipal solid waste generated within Dammam metropolis for period of 25 years. A multi-criteria approach in relation to best engineering design principles are employed based on different sanitary landfill design specifications and models such HELP, LandGEM and web-based landfill design calculator. Accordingly, the sanitary landfill cells and area requirements, gas and leachate generation, collection and monitoring systems as well as the cover system are adequately designed while taking the landfill stability into consideration