شبكة المعلومات الجامعية

بسم اللّه الرحمن الرحيم

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم باللّه العظيم أن المادة التي تم توثيقها وتسجيلها علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات

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Ain Shams University
Faculty of Engineering
Mechanical Power Engineering

CHARACTERISTICS OF MIXING ZONE FOR SUBMERGED WATER DIFFUSER IN OPEN CHANNELS

A Thesis submitted in partial fulfilment of the requirements of the degree of
Doctor of Philosophy in Mechanical Engineering
(Mechanical Power Engineering)

by

Ahmed Gamal Ashmawy Ashmawy

Master of Science in Mechanical Engineering
(Mechanical Power Engineering), 2015

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Cairo - (2021)

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Examiners' Committee

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Statement

This thesis is submitted as partial fulfilment of Doctor of Philosophy in Mechanical Engineering, Faculty of Engineering, Ain shams University.
The author carried out the work included in this thesis. No part of it has been submitted for a degree or a qualification, at any other scientific entity.

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March 2021

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Thesis Summary

In terms of the importance of constructing **Mega Electric Power Stations** in **Egypt**, this research was initiated with the **objective of** enhancing mixing process by single port submerged diffuser. In order to achieve the research objective, a **methodology** was planned to encompass **five stages** (i.e. (Literature Review, Experimental, Numerical Modelling, Analytical and Inferential Investigations).

During the **Literature Review**, in the field of Single port submerged diffuser, was accumulated, studied, scrutinized and categorized into groups.

All through **"Experimental investigation"** 108 experiments were executed to enhance the single-port-submerged-diffuser (SPSD) efficiency, where a single-port-submerged-diffuser without any modification, single-port-submerged-diffuser with propeller (DWP) and a threaded single-port-submerged-diffuser were tested under variable parameters.

During **"Numerical investigation"**, the implemented model governing equations were investigated. In addition, the model was calibrated (i.e. in order to tune its parameters to produce similar results to measured values). Furthermore, the model was verified and runs were executed.

During the "**Analytical investigation"**, an analysis was achieved to investigate the impact of the different parameters (i.e. water depth ratio above the diffuser and Reynolds number ratio) on the thermal pollution.

During the **"Inferential investigation"**, conclusions were drawn and recommendations for Engineering Practice and future research were suggested.

The research **designated** that adding a propeller to the diffuser increase dilution of temperature and reduce mixing zone. In addition, the research **signposted** that increasing the propeller distance so as reduce the velocity increased the center-line temperature and increased mixing zone. Moreover, the research **flagged out** that making a thread at the outlet of the SPSD has no effect on mixing zone. Furthermore, the research **confirmed** that reducing the temperature ratio reduces the mixing zone.

Innovative about this research is **prioritizing** implementation of a free rotating propeller, as it reduces thermal pollution by enhancing mixing process.

Keywords: Thermal power station, Thermal pollution, propeller, dilution, clogging, single port submerged diffuser, temperature distribution

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Eng. Ahmed Gamal Ashmawy

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Table Of Contents