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**Surat Tugas/Letter of Appointment**

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Nomor/  
Number  
Tanggal/  
Date

ST/THS2/0919-B/AAO/IX/2022 - FdI

19 September 2022/19 September 2022

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**Penugasan Sebagai Pembimbing Utama/Pendamping Skripsi Mahasiswa S2 Semester Ganjil 2022/2023**  
**Appointment of Thesis Advisor/Co-Advisor for Master's Degree Student(s) in Odd Semester 2022/2023**

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**Fakultas Teknik & Teknologi Informasi/Faculty of Engineering & Information Technology**

Dekan Fakultas Teknik dan Teknologi Informasi, Universitas Swiss German/  
*The Dean of Engineering and Information Technology Faculty of Swiss German University,*

Menimbang/*Considering:*

1. Perkuliahan S2 semester 2 yg telah berakhir/*The lectures for semester 2 have finished.*
2. Persyaratan untuk mencapai gelar pasca sarjana/*Requirements for Master's Degree graduation.*

Memperhatikan/*Referring to:* Hasil penunjukan Dekan Fakultas Teknik dan Teknologi Informasi/*The appointment by the Dean of Engineering and Information Technology Faculty.*

Memutuskan/*Has Reached the Decision:*

1. Dengan ini menugaskan kepada dosen yang tercantum pada lampiran, sebagai Pembimbing Utama/Pendamping skripsi program Strata Dua (S2) mahasiswa yang tercantum pada lampiran dengan masa penugasan 19 September 2022 sampai dengan 23 Januari 2023/*Herewith gives the task to the lecturers as listed on the attachment to become Thesis Advisor/Co-Advisor for the Masters student(s) listed on the attachment with period of task starting from 19 September 2022 until 23 January 2023.*
2. Dosen yang bersangkutan harus melaksanakan tugas dan tanggung jawab sebaik-baiknya, sesuai dengan petunjuk pembimbingan skripsi dari SGU/*The appointed lecturer shall accomplish the task in responsible ways in line with the thesis guidelines and other regulations given by SGU.*

Terima kasih atas perhatian dan kerjasama Saudara/*Thank you for your attention and cooperation.*

Dekan/*Dean,*



Dr. Maulahikmah Galinium, S.Kom, M.Sc.  
Dekan Fakultas Teknik dan Teknologi Informasi/  
*Dean of Engineering and Information Technology Faculty*

Lampiran/*Attachment:*

Daftar Nama Pembimbing Utama, Pendamping dan Mahasiswa pada Semester Ganjil 2022/2023  
*List of Thesis Advisor, Co-Advisor and Student in Odd Semester 2022/2023.*

1. Lampiran 1/*Attachment 1:* Program Studi Magister Teknik Informatika/*Study Program of Master of Information Technology*
2. Lampiran 2/*Attachment 2:* Program Studi Magister Teknik Mesin/*Study Program of Master of Mechanical Engineering*

Lampiran 2 Surat Tugas: ST/THS2/0919-B/AAO/IX/2022 - FdI  
Attachment 2 to the Letter of Appointment: ST/THS2/0919-B/AAO/IX/2022 - FdI

Daftar Nama Pembimbing Utama/Pendamping Skripsi Pada Program Magister,  
Program Studi Magister Teknik Mesin, Fakultas Teknik dan Teknologi Informasi, pada 19 September 2022 –  
23 Januari 2023

*List of The Thesis Advisor/Co-Advisor Master's Degree Program,  
Study Program of Master of Mechanical Engineering, Faculty of Engineering & Information Technology,  
in 19 September 2022 – 23 January 2023*

**Daftar Pembimbing Utama / List of Advisor**

Nr.	Nama Pembimbing Utama / The Advisor Name	Status Dosen / Lecturer's Status	Nama Mahasiswa / Student's Name	NIM / Student's ID	Judul Skripsi / Thesis Title
1	Dr. Ir. Hanny J. Berchmans, M.Sc.	Dosen Tetap / Homebase Lecturer	Hafidz Akbar	22052011	WATER LEVEL CONTROL PID TUNING BY FUZZY-BASED METHOD FOR A BOILER STEAM DRUM
2	Dr. Ir. Henry Nasution, M.T.	Dosen Tetap / Homebase Lecturer	Rex Henderson Agandhi	22052009	FACE RECOGNITION SYSTEMS FOR RESIDENTIAL SECURITY
		Dosen Tetap / Homebase Lecturer	Achmad Fathoni	22152012	OPTIMIZATION MOISTURE CONTENT USING FUZZY LOGIC BASED ON PROGRAMMABLE LOGIC CONTROLLER (PLC) FOR SOAP DRYING PROCESS
3	Dena Hendriana, B.Sc., S.M., Sc.D.	Dosen Tetap / Homebase Lecturer	Samuel Onasis Keliat	22152003	TURBINE LUBE OIL PURIFICATION SYSTEM AT STEAM POWER GENERATION PLANTS
			Angga Widi Fitriyanto	22152013	OPTIMIZE CHILI PASTE PRODUCTION TIME USING DIRECT FEEDING AUTOMATIC DOSING SYSTEM
4	Dr. Ir. Gembong Baskoro, M.Sc.	Dosen Tetap / Homebase Lecturer	Oma Budi Herawan	22152015	MAINTENANCE SPARE PARTS OPTIMIZATION BY USING ANALYTIC HIERARCHY PROCESS (AHP) IN OIL AND GAS INDUSTRY: STUDY CASE
5	Dr.-Eng. Cuk Supriyadi Alin Nandar	Dosen Tetap / Homebase Lecturer	Irsyad Razaqi	22152014	DESIGN AND DEVELOPMENT OF HUMAN MACHINE INTERFACE (HMI) AND REPORTING SYSTEM IN BAGGING PROCESS
6	Dr. Ir. Widi Setiawan	Dosen Tidak Tetap / Non Homebase Lecturer	Rian Wiranto	22152016	ACCURACY OPTIMIZATION OF LIQUID INK AUTOMATIC FILLING MACHINE USING FUZZY CONTROL

**Daftar Pembimbing Pendamping / List of Co-Advisor**

Nr.	Nama Pembimbing Pendamping / The Co-Advisor Name	Status Dosen / Lecturer's Status	Nama Mahasiswa / Student's Name	NIM / Student's ID	Judul Skripsi / Thesis Title
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			Rian Wiranto	22152016	ACCURACY OPTIMIZATION OF LIQUID INK AUTOMATIC FILLING MACHINE USING FUZZY CONTROL
2	Dr. Ir. Widi Setiawan	Dosen Tidak Tetap / Non Homebase Lecturer	Rex Henderson Agandhi	22052009	FACE RECOGNITION SYSTEMS FOR RESIDENTIAL SECURITY
3	Dr. Ir. Hanny J. Berchmans, M.Sc.	Dosen Tetap / Homebase Lecturer	Samuel Onasis Keliat	22152003	TURBINE LUBE OIL PURIFICATION SYSTEM AT STEAM POWER GENERATION PLANTS
			Angga Widi Fitriyanto	22152013	OPTIMIZE CHILI PASTE PRODUCTION TIME USING DIRECT FEEDING AUTOMATIC DOSING SYSTEM
4	Dr. Eng. Aditya T. Pratama, S.Si., M.T.	Dosen Tetap / Homebase Lecturer	Oma Budi Herawan	22152015	MAINTENANCE SPARE PARTS OPTIMIZATION BY USING ANALYTIC HIERARCHY PROCESS (AHP) IN OIL AND GAS INDUSTRY: STUDY CASE
5	Dr.-Eng. Cuk Supriyadi Alin Nandar	Dosen Tetap / Homebase Lecturer	Achmad Fathoni	22152012	OPTIMIZATION MOISTURE CONTENT USING FUZZY LOGIC BASED ON PROGRAMMABLE LOGIC CONTROLLER (PLC) FOR SOAP DRYING PROCESS
6	Dena Hendriana, B.Sc., S.M., Sc.D.	Dosen Tetap / Homebase Lecturer	Irsyad Razaqi	22152014	DESIGN AND DEVELOPMENT OF HUMAN MACHINE INTERFACE (HMI) AND REPORTING SYSTEM IN BAGGING PROCESS

Jumlah Pembimbing Utama Skripsi Program Studi Magister Teknik Mesin pada Semester Ganjil 2022/2023 adalah 6 orang/  
*The Thesis Advisor of Study Program of Master of Mechanical Engineering Odd Semester 2022/2023 in total are 6 persons*

Jumlah Pembimbing Pendamping Skripsi Program Studi Magister Teknik Mesin pada Semester Ganjil 2022/2023 adalah 6 orang/  
*The Thesis Co-Advisor of Study Program of Master of Mechanical Engineering Odd Semester 2022/2023 in total are 6 persons*

Dekan/Dean,



Dr. Maulahikmah Galinium, S.Kom, M.Sc.  
Dekan Fakultas Teknik dan Teknologi Informasi/  
*Dean of Engineering and Information Technology Faculty*

## STATEMENT BY THE AUTHOR

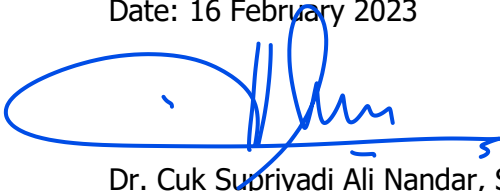
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Study Program : Master of Mechanical Engineering  
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Thesis Title : OPTIMIZE NITRIC ACID INJECTION PID CONTROL LOOP IN AMMONIUM NITRATE - FINAL SCRUBBER SYSTEM TO REDUCE ENVIRONMENTAL AND HUMAN RISK OF NH<sub>3</sub> AND HNO<sub>3</sub> FUME

I hereby declare that this submission is my own work and to the best of my knowledge, it contains no material previously published or written by another person, nor material which to a substantial extent has been accepted for the award of any other degree or diploma at any educational institution, except where due acknowledgement is made in the thesis.



Irsyad Razaqi  
(Name of Student)

Approved by:  
Date: 16 February 2023



Dr. Cuk Supriyadi Ali Nandar, S.T.,  
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(Thesis Co-Advisor)

Acknowledged by:  
Date: 16 February 2023



Dr. Maulahikmah Galinium, S.Kom, M.Sc.  
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**OPTIMIZE NITRIC ACID INJECTION PID CONTROL LOOP IN  
AMMONIUM NITRATE - FINAL SCRUBBER SYSTEM  
TO REDUCE ENVIRONMENTAL AND HUMAN RISK OF NH<sub>3</sub> AND HNO<sub>3</sub>  
FUME**

By

Irsyad Razaqi  
22152014

MASTER'S DEGREE  
in

MECHANICAL ENGINEERING - MECHATRONIC  
FACULTY OF ENGINEERING & INFORMATION TECHNOLOGY



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January 2023

## ABSTRACT

### OPTIMIZE NITRIC ACID INJECTION PID CONTROL LOOP IN AMMONIUM NITRATE - FINAL SCRUBBER SYSTEM TO REDUCE ENVIRONMENTAL AND HUMAN RISK OF NH<sub>3</sub> AND HNO<sub>3</sub> FUME

By

Irsyad Razaqi

Dr. Cuk Supriyadi Ali Nandar ST, M. Eng., Advisor

Dena Hendriana, B. Sc., S.M., Sc.D., Co-Advisor

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pH value in the Ammonium Nitrate (AN) manufacturing is one of the key aspects to control, since acidic condition is one of the catalysts that can lead to AN decomposition and explosion. Uncontrolled pH in AN manufacturing also can lead to various environment and human risk. This research purpose is to control pH in Ammonium Nitrate solution specifically in the Final Scrubber System using PID control to prevent risk on environment and human. Several setting using methods from Ziegler Nichols, Cohen-Coon, and Auto-Tune using Siemens PCS 7 DCS are implemented in this research. Throughout the research, it was found that the Final Scrubber System pH Control introduce a long dead time. Four from six PID setting successfully maintain the pH in the Final Scrubber System. The final PID setting that used in the system is from Cohen-Coon with PI only.

*Keywords: Ammonium Nitrate, pH Control, PID, PID Tuning, Auto Tune PID, Long deadtime, Process Response Test, Siemens PCS 7*

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## **DEDICATION**

I dedicate this research work for my late father, my mother, my wife, my lovely daughter, and for my country Indonesia

## **ACKNOWLEDGEMENTS**

I would like to express my deepest appreciation and gratitude to my thesis advisors Dr. Cuk Supriyadi Ali Nandar ST, M. Eng. as Thesis Advisor for the guidance and direction especially in the technical aspect of this research. Furthermore, I wish to convey my gratitude to Mr. Dena Hendriana B.sc., S.M., Sc.D. as Thesis Co-Advisor that was extremely helpful in guiding me on research thinking framework and also qualitative methodology.

Finally, I would like to thank Mr. Dr. Maulahikmah Galinium, S.Kom., M.Sc as Dean of Faculty Engineering and IT at Swiss German University – Indonesia for giving me opportunity to learn in the prestigious University.

I have found my coursework throughout the Curriculum and Instruction program to be Stimulating and thoughtful, providing me with the tools with which to explore both past and present ideas and issues.

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