

**RESEARCH PROJECT**

**THE COMBINATION OF ADSORPTION WITH MODIFIED  
ZEOLITE AND AQUAPHONIC SYSTEM TO REMOVE TOTAL  
AMMONIA NITROGEN IN FISH POND**



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SURABAYA**

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**LETTER OF APPROVAL**

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**The Combination Of Adsorption with Modified Zeolite and Aquaponic System to Remove Total Ammonia Nitrogen in Fish Pond**

which was conducted and submitted by :

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has been approved and accepted as one of requirement for **Bachelor of Engineering** degree in Chemical Engineering Department, Faculty of Engineering, Widya Mandala Surabaya Catholic University by following supervisor/s and has been examined by the committees on 25<sup>th</sup> May, 2015.

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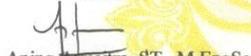
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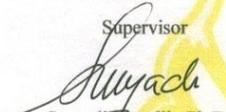
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Surabaya, 8<sup>th</sup> June 2015



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## PREFACE

The authors would like to thank God for His blessing so our research project has been accomplished. This report is a prerequisites in achieving Bachelor of Engineering degree in Chemical Engineering. The writers realize that the completion of this report is achieved by the help of many people. Therefore, the writers would like to thank to:

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The authors realize that this report is far from perfect, therefore any critics and comments which will better improve the research is gladly accepted. Lastly the authors hope that the report will be useful to all readers who need information regarding the research of the report.

Surabaya, 8<sup>th</sup> June 2015



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## ABSTRACT

Ammonia contamination at the fish pond caused serious health problem for the fish due to high toxicity. Koi fish is considered as ammonia factory because during its metabolism, the fish produce large amount of ammonia which is directly related to the amount of food given each day. The concentration of ammonia in water must be controlled carefully because of its toxicity to koi fish that may cause stress and damages gills and other tissue, even in small concentration. Its mechanism includes blocking the oxygen transfer from the gills to the blood and may cause both immediate and long term gill damage. In this study, ammonia removal was conducted using aquaphonics-zeolite system. Green mustards were used as the aquaphonic plants and natural zeolites which obtained from ponorogo were modified using Sodium Chloride (0-5%) while the food amount given to the fish controlled at 0,1-0.3% mass of the fish. The total ammonia nitrogen was measured one hour after the fish was fed.

The objectives of this reseearch are to study the effect of fish food addition on total ammonia nitrogen in the fish pond, to study the effect of NaCl addition on total ammonia nitrogen in the koi fish pond, and to study the effect of combination of fish food addition and zeolite modification on total ammonia nitrogen by using MANOVA. In this research, the concentration of total ammonia nitrogen was analyzed using spectrophotometer.

Column studies were also conducted to find the breakthrough time of the pristine and modified zeolite and thomas model were found to fit the experimental data with good agreement. Adsorption isotherm were conducted to find the maximum adsorption capacity and the experimental data were fitted using Langmuir and Freundlich model where Langmuir model gave the best data interpretation. Kinetic studies concluded that the pseudo-second order control the adsorption mechanism.. The differences in the independent variables were found to give significance towards the responses proved by MANOVA method.

From the research that was done, the adsorption using zeolite was effective, which could be seen from the result of coloumn studies that synthetic  $\text{NH}_4\text{Cl}$  solution need longer time reach breakthrough state rather than the real aquaphonic system water. In this research, adsorption isotherm was appropriate using Langmuir equation, which could be seen from the value of good correlation factor ( $R^2$ ), between 0.95 to 0.99 for Langmuir equation and pseudo second order was chosen for adsorption kinetics, which could be seen from the consistency of  $k_s$  as parameter. The aquaphonic and zeolite adsorption method was gave significant effect to

fish pond which could be seen from the significant value  $< 0.1$  in MANOVA statistic method.