# ETHYL ALCOHOL FROM MOLASSES
# PLANT DESIGN
# WITH CAPACITY 40,000 TON/YEAR

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Hereby declare that I am the sole author of this project report, except the quotes, data, summaries, and other materials which I clearly cite their references.

I understand that if it is proven otherwise, my degree may be confiscated.

Surakarta, April 27 2017

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*ABSTRACT*

*Ethyl alcohol is the principal type of alcohol in alcoholic beverages. Ethyl alcohol is mostly produced by the fermentation of sugar by yeast or by petrochemical processes. Ethyl alcohol is a chemical product primarily used for antiseptic, antidote, medical solvent, recreational, fuel (engine fuel, rocket fuel, fuel cells), household heating, feedstock, solvent, and low temperature liquid(used in laboratories with dry ice or other coolants). The plant of ethyl alcohol from molasses as raw material will be established in Sukoharjo, Central Java with capacity 40,000 tons/year and built in year 2020. The raw of molasses is obtained from some suppliers around Solo – Semarang, Central Java. The production of ethyl alcohol is carried out in a fermenter where the operating condition of pressure and temperature are 1 atm and isothermally at 35°C, respectively. Utility needs to support the process. Used water as much as 187,154.6378 kg/h which is obtained from river water. Air and compressed air as much as 50 $m^3$/h also needs to suport the process. The other utilities needs is steam 66,767,052.8459 kg/h and electricity 350 kw/h.*

*This ethyl alcohol plant has 330 operational days with Fixed Capital as much as Rp 74,261,326,185.2297 and known the Working Capital as much as Rp 45,472,670,854.7867. From the economic evaluation that had been calculated before showed that the Profit before tax is about Rp 25,002,027,285.4679, while the Profit after tax about Rp 17,501,419,099.8275. From the calculation also known that the Return On Investment before tax is about 33.6676%, while Return On Investment after tax is about 23.5673%. The Pay Out Time before tax shown the number of 2.2900 years with Pay Out Time after tax are 2.9791 years. Break Event Point is 53.8313% and Shut Down Point is about 41.2793%, and Discounted Cash Flow as much as 30.2125%. From the results of economic evaluation this Ethyl alcohol plant is feasibly established and operated.*

# FOREWORD

بِسْمِ اللَّهِ الرَّحْمَٰنِ الرَّحِيمِ

*Assalamu'alaikum Wr. Wb.*

Alhamdulillah, all praises be to Allah SWT who has given many mercies and blessing so the author can finish the Final Project of Chemical Plant Design without any troubles. Secondly, may peace be upon the prophet Muhammad SAW who has guided us from the darkness into the brightness.

Title for this Final Project is "Ethyl Alcohol From Molasses Plant Design With Capacity 40,000 Tons/Year". Every student in Chemical Engineering at Universitas Muhammadiyah Surakarta should take plant design as final project to be able to graduate as bachelor of enginering. With this final project, there is hope so analitical and teoritical while studying can be applied correctly.

This final asignment completion is supportted by many peopele around author, so in this opportunity, author would like to express the sincere thanks to all who helped resolve this research report, especially to :

1. Mr. Rois Fatoni, S.T, M.Sc, PhD as Chemical Engineering Department Chief and author 1st supervisor.
2. Mrs.Eni Budiati, S.T., M.Eng as final project coordinator.
3. Mr. Dr. Ahmad M. Fuadi as author 2nd supervisor.
4. Ir. Herry Purnama, Ph.D and Ir. Haryanto AR, M.S as evaluator of this final project.
5. Author parents that always give a lot of love, pray, and support at home. So author can finish this final project.
6. Author husband Nurohman Sigit H, who have help in process writing and give some spirit when author get down also give a lot of love so the author can done this final asignment.
7. All lecturers at Muhammadiyah University of Surakarta.
8. All family that always prays and support author.
9. All help from friends in Muhammadiyah University of Surakarta.

Author is aware this final asignment still have a lot of flaws and it's far from perfection. Author expects hopefully this report can be useful for those who need information about the material covered in this report.

*Wassalamu'alaikum Wr. Wb.*

Surakarta, April 2017

Author

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# MOTTO

- ✓ **If you can dream you can do it**
- ✓ **Do the best, be good, then you will be the best**
- ✓ **Keep thinking the out of the box, keep executing the inside of the box**

Presented

- All praises be to Allah SWT who has given many mercies and blessing so the author can finish the Final Asignment of Chemical Plant Design without any troubles.
- May peace be upon the prophet Muhammad SAW who has guided us from the darkness into the brightness.
- Mom and Dad, thanks for the love, pray, and support so I can be like this. Thanks for all that you have given to me. I just can say thank you and I love you all.
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Hopefully what I studied before can helps others. Aamiin.