Major Project Report On

Biodiesel from Mustard Oil: A Sustainable Engine Fuel Substitute For Chhattisgarh

submitt with retial fulfilme of the requirement for the award of

in CHEMICAL ENGINEERING

SUBMITTED BY

Ghanshyam (21021119)

Mohit Singh (21021128)

Nandini Dixit (21021129)

Abhishek Acharyya (21021153)

UNDER THE GUIDANCE OF

Dr. Raghwendra Singh Thakur

Associate Professor, Department of Chemical Engineering



DEPARTMENT OF CHEMICAL ENGINEERING
SCHOOL OF STUDIES OF ENGINEERING & TECHNOLOGY
GURU GHASIDAS VISHWAVIDYALAYA
(A CENTRAL UNIVERSITY)
BILASPUR, CHHATTISGARH, INDIA

APRIL 2025



Department Of Chemical Engineering School Of Studies Of Engineering & Technology Guru Ghasidas Vishwavidyalaya, Bilaspur, India

CERTIFICATE

This is to certify that the major project entitled "Biodiesel from Mustard Oil: A Sust mable Engine Fuel Substitute for Chhattisgarh" submitted by Ghanshyam (21121119), Mohit Singh (21021128), Nandini Dixit (21021129) and Abhishek Acharyya (21021153) to the Department of Chemical Engineering, School of Studies of Engineering & Technology, Guru Ghasidas Vishwavidyalaya (A Central University), Bilaspur, Chhattisgarh, India towards the partial fulfillment of the requirements for the award of the degree of Bachelor of Technology in Chemical Engineering is a bonafide record of the work carried out by them under my supervision and guidance.

Approved by

Prof. Amit Jain

Head

Department of Chemical Engineering
School of Studies of Engineering & Technology,
Guru Ghasidas Vishwavidyalaya
Bilaspur, Chhattisgarh

Place: Bilaspur

Date: 05.05.2025

Guided by

Dr. Raghwendra Singh Thakur

Associate Professor

Department of Chemical Engineering

School of Studies of Engineering & Technology

Guru Ghasidas Vishwavidyalaya

Bilaspur, Chhattisgarh

TABLE OF CONTENTS

| CERTIFICATE | ii |
|---|----|
| DECLARATION | |
| ACKNOWLEDGEMENT | |
| LIST OF FIGURES | |
| LIST OF TABLES | |
| ABSTRACT | |
| TABLE OF CONTENTS | |
| CHAPTER 1 - INTRODUCTION | |
| 1.1 Background | |
| 1.2 Objectives | |
| 1.3 Scope | |
| 1.4 Vegetable Oil as Engine Oil | |
| 1.4.1 Composition of Vegetable Oils | 7 |
| 1.4.2 Biodiesel from Vegetable Oil | 7 |
| 1.4.3 Challenges and Solutions in Using Vegetable Oils as Engine Fuel | 9 |
| 1.4.4 Use of Biodiesel and Energy Policies in India and Chhattisgarh | 12 |
| 1.5 Mustard Oil as Biodiesel | 13 |
| 1.5.1 Global Cultivation and Utilization | 13 |
| 1.5.2 Mustard Oil in Chhattisgarh, India | 14 |
| 1.5.3 Engines Running with Pure Mustard Oil in India | 14 |
| 1.5.4 Preparation of Mustard-Oil based Biodiesel | 14 |
| 1.5.5 Performance and Emissions | 18 |
| 1.5.6 Advantages and Limitations | 20 |
| CHAPTER 2- LITERATURE SURVEY | 24 |
| CHAPTER 3- METHODOLOGY | 24 |
| 3.1 Materials Used | 25 |
| ITTO AND PHALLED | |
| 13 [-kand []] | |
| | |
| | |
| | |
| 4.2.2 Specific Gravity | 30 |
| | |
| 4.3 Fuel Properties of Mustard Oil-Based Bloadest | |

| CHAPTER 5- ECONOMIC AND ENVIRONMENTAL FEASIBILITY | 2 |
|--|----|
| 5.1 Cost Comparison of Biodiesel and Diesel in Chhattisgarh | 33 |
| 5.1.1 Current Market Prices and Subsidies | 33 |
| 5.1.2 Production Cost of Biodiesel from Mustard Oil | 33 |
| 5.1.3 Economic Benefits of Local Biodiesel Production | 33 |
| 5.2 Comparison with Other Feedstocks for Division | 34 |
| 5.2 Comparison with Other Feedstocks for Biodiesel Production in Chhattisgarh | 35 |
| 5.2.1 Mustard Oil vs. Other Feedstocks | 35 |
| 5.2.2 Agricultural and Environmental Considerations. | |
| 5.3 Economic Model for Supporting Local Communities Through Biodiesel Production | |
| 5.3.1 Understanding the Community Impact | |
| 5.3.2 Financial Mechanisms for Community Support | |
| 5.3.3 Cost-Benefit Analysis for Rural Development | |
| 5.4 Environmental Assessment of Biodiesel from Mustard Oil in Chhattisgarh | |
| 5.4.1 Greenhouse Gas Emissions and Carbon Footprint | |
| 5.4.2 Impact on Air Quality | |
| 5.4.3 Soil and Water Conservation | |
| CHAPTER 6- CONCLUSION | |
| 6.1 Sustainability Analysis | |
| 6.1.1 Economic Sustainability | |
| 6.1.2 Environmental Sustainability | 41 |
| 6.1.3 Social Sustainability | 42 |
| 6.2 Engine Performance Analysis | 42 |
| 6.2.1 Engine Compatibility | 42 |
| 6.2.2 Performance Under Different Loads | 43 |
| 6.2.3 Long-Term Engine Durability | 43 |
| 6.3 Future Aspects and Recommendations 6.3.1 Glycerol Removal and Utilization | 43 |
| 6.3.1 Glycerol Removal and Utilization | 44 |
| 1 La Greatructure Development | |
| 1 F mig Growth | |
| | |
| | |
| 6.4 Concluding Remarks | 47 |
| CUADTER 7- REFERENCES | |