

## ACKNOWLEDGMENT

Praised thanks to the Lord Jesus Christ, because of his guidance, grace, and blessed to my final project. The author realized that without any helps, supports, advice, and prayer from all of the sides, this final project report cannot be finished on time. Because of that, the author would like to give thanks to:

1. Dad (Tjahjono), Mom (Liliek), and Sister (Dian), who have provided a morale and material support to the author to accomplished this final project.
2. Prof. Dr. Monang Manullang, MSc., Ph.D, as the final supervisor who always gave the helps, guidance, advice, suggestion, and briefing during the final project and also in the compilation of the final project.
3. Mr. Jeremia Manuel, MP, as the co-supervisor who always gave helps, guidance, advice, suggestion, and support during the compilation of final project.
4. Mrs. Nuri Arum Anugrahati, MP, Head of Food Technology Department in Universitas Pelita Harapan on the opportunity that was given to the author to complete the final project and final project report.
5. Mrs. Julia Ratna Wijaya, MAppSc, who always encourage the author.
6. Mr. Tagor as the Head of Chemistry Laboratory, Ms. Mery as the Head of Quality Control Laboratory, Ms Ratna as the Head of Research Laboratory
7. Mr. Donny as Food Processing Laboratory laborant who gives help and support during the completion of final project.
8. Mr. Rudy and Mr. Ade as Quality Control Laboratory laborant, who always eased and helped the writer during the research.

9. Mr. Anton and Mrs. Putri who help, support the writer not only in the completion of final project but also in three and half years in this faculty.
10. The lectures who gave knowledge that was valuable and important for the period of lecturing, and employees of the library Universitas Pelita Harapan that helped the compilation of this final project report.
11. Angellya Lyanto, Stephanie Harijanto, and Juan Ariestya, who gave input, advice, and morale support, and also cheer up the author during the completion of this final project report.
12. My best friends, Ricky, De'fany, Vero, Winna, Adrian, and Dharmawan, who always support, pray, and cheer up not only during this final project but also for three and a half years.
13. And every sites which could not be mentioned one by one.

Finally, the author realized that this report is not perfect, because of that all suggestions and critics will be gratefully received because it will be advantageous for the author. The author also expects that this proposal can provide the benefit for the person who read and able to become the source of the inspiration for person that needed. God bless.

Karawaci, January 2011

Author

# TABLE OF CONTENT

	Pages
<b><u>STATEMENT OF THESIS AUTHENTICITY</u></b>	
<b><u>APPROVAL BY THESIS SUPERVISORS</u></b>	
<b><u>APPROVAL BY THESIS EXAMINATION COMMITTEE</u></b>	
<b><u>ABSTRACT</u></b> .....	v
<b><u>ACKNOWLEDGEMENT</u></b> .....	vi
<b><u>TABLE OF CONTENT</u></b> .....	viii
<b><u>LIST OF TABLE</u></b> .....	x
<b><u>LIST OF FIGURES</u></b> .....	xi
<b><u>LIST OF APPENDICES</u></b> .....	xii
<b><u>CHAPTER I INTRODUCTION</u></b> .....	<b>1</b>
1.1 Background .....	1
1.2 Research Problems .....	2
1.3 Objective .....	3
1.3.1 General Objective .....	3
1.3.2 Specific Objective .....	3
<b><u>CHAPTER II LITERATURE REVIEW</u></b> .....	<b>4</b>
2.1 Sausage.....	4
2.1.1 Ingredients for Making Sausage .....	5
2.1.2 Type of Sausage .....	7
2.2 Sausage Casing. ....	8
2.2.1 Beef Bungs, Rounds, and Casing.....	9
2.2.2 Lamb and Sheep Casing .....	9
2.2.3 Hog casing .....	9
2.2.4 Cellulosic Casing .....	9
2.2.5 Collagen Casing .....	9
2.2.6 Synthetic Casing .....	9
2.3 Fish .....	10
2.3.1 Cat Fish ( <i>Pangasius micronemus</i> ) .....	11
2.3.2 Little Tuna ( <i>Euthynnus affinis</i> ).....	13
2.4 Surimi.....	15
2.4.1 Production Process Surimi .....	16
2.4.2 The Effect of Salt Addition .....	18
2.4.3 The Effect of Cryoprotectant Addition .....	18
2.5 Food Additive .....	19
2.5.1 Carboxymethyl Cellulose .....	20
<b><u>CHAPTER III METHODOLOGY</u></b> .....	<b>22</b>
3.1 Materials and Equipments.....	22
3.2 Research Procedure .....	22

3.2.1 Preliminary Research .....	22
3.2.2 Main Research .....	25
3.3 Design of Experiment .....	27
3.3.1 Preliminary Research .....	27
3.3.2 Main Research .....	28
<b><u>CHAPTER IV RESULTS AND DISCUSSION</u></b> .....	<b>30</b>
4.1 Preliminary Research.....	30
4.1.1 Raw Material Composition Proximate Analysis .....	30
4.1.2 Preliminary Research Analysis .....	33
4.2 Main Research.....	49
4.2.1 Gel Strength.....	51
4.2.2 Water Holding Capacity .....	54
4.2.3 Protein Content .....	56
4.2.4 Color.....	57
4.2.5 Moisture Content .....	60
4.2.6 Sensory Evaluation .....	61
4.2.7 Omega-3 Content.....	64
4.2.8 Determination The Best Sausage.....	67
4.2.9 Comparison Between The Best Sausage With Comercial Product	67
<b><u>CHAPTER V CONCLUSIONS AND SUGGESTIONS</u></b> .....	<b>70</b>
5.1 Conclusions .....	70
5.2 Suggestions .....	70
<b>BIBLIOGRAPHY</b> .....	<b>71</b>
<b><u>APPENDICES</u></b> .....	<b>79</b>

## LIST OF TABLE

	Pages
Table 3.1 Formulation for making surimi.....	25
Table 3.2 Formulation for making sausage.....	27
Table 3.3 Design of experiment for preliminary research .....	27
Table 3.4 Design of experiment for main research .....	29
Table 4.1 The result of proximate analysis in raw material.....	31
Table 4.2 Overall result of analyses of preliminary research.....	34
Table 4.3 The effect of different concentration carboxymethyl cellulose toward gel strength .....	35
Table 4.4 The effect of different concentration carboxymethyl cellulose toward liquid loss .....	38
Table 4.5 The effect of different concentration carboxymethyl cellulose toward color of surimi .....	40
Table 4.6 The effect of different concentration carboxymethyl cellulose toward pH of surimi.....	43
Table 4.7 The effect of different concentration carboxymethyl cellulose toward water activity of surimi .....	44
Table 4.8 The effect of different concentration carboxymethyl cellulose toward crude protein of surimi .....	46
Table 4.9 The effect of different concentration carboxymethyl cellulose toward folding test of surimi.....	48
Table 4.10 Overall result of analyses of main research.....	50
Table 4.11 The effect of different internal temperature toward gel strength of fish sausage .....	52
Table 4.12 The effect of different internal temperature toward water holding capacity of fish sausage.....	54
Table 4.13 The effect of different internal temperature toward percentage of protein of fish sausage.....	56
Table 4.14 The effect of different internal temperature toward whiteness of fish sausage .....	58
Table 4.15 The effect of different internal temperature toward moisture content of fish sausage.....	60
Table 4.16 The result of pore uniformity analysis .....	62
Table 4.17 The result of flavor analysis.....	63
Table 4.18 The result of aroma analysis .....	63
Table 4.19 The result of overall analysis .....	64
Table 4.20 The Omega-3 (mg/g) content in different internal temperature.....	64
Table 4.21 The comparison between sausage brand “X” with the best sausage on the research.....	67
Table 4.22 The comparison of sensory analysis between sausage brand “X” with the best sausage on the research .....	69

## LIST OF FIGURES

	Pages
Figure 2.1 Sausage.....	4
Figure 2.2 <i>Pangasius micronemus</i> .....	12
Figure 2.3 Taxonomy of <i>Pangasius sp.</i> ....	13
Figure 2.4 <i>Euthynnus affinis</i> .....	14
Figure 2.5 Taxonomy of <i>Euthynnus affinis</i> .....	14
Figure 2.6 Carboxymethyl cellulose structure .....	21
Figure 3.1 Flowchart of surimi gel processing.....	24
Figure 3.2 Flowchart of fish sausage .....	26
Figure 4.1 The effect of different concentration carboxymethyl cellulose toward gel strength .....	37
Figure 4.2 The effect of different concentration carboxymethyl cellulose toward liquid loss (%).....	39
Figure 4.3 The effect of different concentration carboxymethyl cellulose toward color of surimi .....	41
Figure 4.4 The effect of different concentration carboxymethyl cellulose toward pH of surimi.....	43
Figure 4.5 The effect of different concentration carboxymethyl cellulose toward water activity of surimi .....	45
Figure 4.6 The effect of different concentration carboxymethyl cellulose toward crude protein of surimi.....	47
Figure 4.7 The effect of different internal temperature toward gel strength of fish sausage .....	53
Figure 4.8 The effect of different internal temperature toward water holding capacity of fish sausage.....	55
Figure 4.9 The effect of different internal temperature toward percentage crude protein of fish sausage.....	57
Figure 4.10 The effect of different internal temperature toward whiteness of fish sausage .....	59
Figure 4.11 The effect of different internal temperature toward percentage moisture content of fish sausage.....	61
Figure 4.12 Chromatograph gas chromatography omega-3.....	66

## LIST OF APPENDICES

	Pages
Appendices 1. Proximate Analysis .....	76
Appendices 2. Preliminary Research Analysis Procedure .....	79
Appendices 3. Main Research Analysis Procedure .....	82
Appendices 4. Result of Proximate Analysis of Fish .....	85
Appendices 5. Result of Preliminary Research on Gel Strength Analysis .....	92
Appendices 6. Result of Preliminary Research on Water Holding Capacity Analysis .....	95
Appendices 7. Result of Preliminary Research on Color Analysis .....	98
Appendices 8. Result of Preliminary Research on pH Analysis .....	101
Appendices 9. Result of Preliminary Research on Water Activity Analysis .....	104
Appendices 10. Result of Preliminary Research on Protein Analysis .....	107
Appendices 11. Result of Preliminary Research on Folding Test Analysis .....	110
Appendices 12. Result of Main Research on Gel Strength Analysis .....	115
Appendices 13. Result of Main Research on Water Holding Capacity Analysis .....	118
Appendices 14. Result of Main Research on Protein Analysis .....	121
Appendices 15. Result of Main Research on Color Analysis .....	124
Appendices 16. Result of Main Research on Moisture Content Analysis .....	127
Appendices 17. Result of Main Research on Sensory Analysis .....	130
Appendices 18. Result of Comparison of Comercial Product with Best Sausage in Research Toward Sensory Analysis (scoring) .....	147
Appendices 19. Gas Chromatography .....	153
Appendices 20. Calibration Thermometer .....	154