

## Table of Contents

Dedication.....	III
Acknowledgments.....	IV
ABSTRACT.....	V
Table of contents.....	VII
List of tables.....	IX
List of figures.....	X
List of abbreviations.....	XIV
CHAPTER ONE.....	1
1.1. Introduction.....	1
CHAPTER TWO.....	5
2.1. Literature review.....	5
2.2. Measurements of sludge settleability.....	17
2.3. Type of filamentous microorganisms.....	18
2.4. Isolation and identification of filamentous microorganisms.....	20
2.5. Some factors causing filamentous bulking.....	21
2.5.1. Dissolved oxygen level.....	23
2.5.2. Substrate concentration (F/M Ratio).....	23
2.5.3. Septicity.....	24
2.5.4. Grease and Oil.....	24
2.5.5. Nutrients deficiency.....	24
2.5.6. Low pH.....	25
2.5.7. Sludge loading and sludge age.....	25
2.5.8. Low temperature.....	25
2.6. Research Goal and Objectives.....	26
CHAPTER THREE (Materials and Methods).....	28
3.1. Site description and design data.....	28
3.2. Sampling sites.....	32

3.3. Analytical methods.....	34
3.3.1 Physical tests.....	34
3.3.2 Chemical tests.....	38
3.3.3 Biological tests.....	40
3.4. Statistical analysis.....	43
3.5. Microscopic examination and filamentous bacteria identification in activated sludge system.....	43
CHAPTER FOUR (Results and Discussion).....	45
4.1. Physical, chemical and biological parameters of Al-Bireh wastewater treatment plant .....	45
4.1.1 Physical parameters.....	47
4.1.1.1 Temperature.....	47
4.1.1.2 pH value.....	49
4.1.1.3 Dissolved oxygen.....	51
4.1.2 Chemical parameters.....	54
4.1.2.1 Organic nitrogen and Orthophosphate ( $\text{PO}_4^{3-}$ ).....	54
4.1.2.2 Fat, oil, and grease (FOG).....	57
4.1.2.3 Sludge age and F/M ratio.....	59
4.2. Identification of filamentous microorganisms in aeration tanks of AWWTP.....	62
4.3. Process performance and sustainability of the ASS process during the appearance of sludge bulking and foaming phenomena.....	68
4.4. Microbial activities of foams in activated sludge system.....	90
CHAPTER FIVE (Conclusions and recommendations).....	94
5.1 Conclusions.....	94
5.2 Recommendations.....	96
References.....	97
الخلاصة.....	107
Annexes.....	108