UNIVERSITI TEKNOLOGI MARA

HIGH PERFORMANCE LIQUID CHROMATOGRAPHY NETWORK BASED AUTOMATED DATA ACQUISITION SYSTEM FOR PHARMACEUTICAL RESEARCH APPLICATIONS

MOHAMMAD SHUKRI BIN HAPEEZ

Thesis submitted in fulfilment of the requirement
for the degree of
Masters of Science

Faculty of Electrical Engineering

MARCH 2011

ABSTRACT

Sharing an experimental result of chromatography process is very crucial in pharmaceutical research industries, where large amount of result need to be obtained. The chromatography data are saved into its owned exclusive file format and the file is unable to be read without the proprietary software application, in addition, the data are not sharable. Saving the experimental results in format that can be read by any common computer application is important and storing the file which can be shared by other users is very important where data and information are kept and shared digitally. The automated acquisition method presented in this thesis, is to provide an alternative in obtaining chromatography data in open source format which can be read without using the proprietary software and the chromatography data can be shared. Automated Acquisition Chromatogram System (AMCOS) has been developed to allowing users save the experimental results from the HPLC instrument in an open source format. Chromatogram Online System (CONSYS) has been developed as the centralized database system where other users can share the stored chromatography data and the outcome of this work is to have the obtained chromatograms in an open source format and shared the obtained chromatogram by other users.

ACKNOWLEDGEMENTS

Allah is the Greatest, Glory be to Allah, Praise be to Allah, there is no god but Allah. "Praise be to Allah, who created the heavens and the earth, and made the darkness's and light'" (6:1).

"So when they have reached their prescribed time, retain them with kindness or dismiss them with kindness, and call to witness two just ones from among you, and give upright testimony for Allah. With that is admonished he who believes in Allah and the Latter Day. And whoever keeps his duty to Allah, He ordains a way out for him," (65:2)

"And gives him sustenance from whence he imagines not. And whoever trusts in Allah, He is sufficient for him. Surely Allah attains His purpose. Allah indeed has appointed a measure for everything". (65:3)

Praise to Allah, who promised his faithful slaves victory and support by saying, "And it was a duty incumbent upon us to aid those who believed." I bear witness that there is none to worshipped except Allah, One, with no partners. He sent His Messenger, Muhammad, with guidance and the religion of truth to prevail over all religions even though the unbelievers may detest it." and I bear witness that our Beloved Prophet Muhammad, is the Messenger of Allah.

Praise to Allah, for, without His Grace and Compassion, none of the miracle in the world would have happened. Highest gratitude and salute to those who has endowed, to the triumph of completing this work and the writing of this thesis, directly or indirectly. For the kindest and support throughout the research epoch which I have receive full-heartedly, aid and nurture, only Allah would repay and blessed it.

Sincerely,
Mohammad Shukri bin Hapeez

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

1.0 Introduction

Chromatography is a laboratory technique used to separate a compound into its constituents so that the constituents of the compound can be identified and further analysed. There are various possible methods of chromatography. It can also be used for the assessment of active ingredients, raw materials, impurities and determining the stability of samples. Chromatography is also referred as a molecular separation technique. Chromatography process is usually performed using an instrument called High Performance Liquid Chromatography (HPLC) and is usually used in biochemistry and analytical chemistry. The data obtained from the chromatography process is called chromatogram. A chromatogram can be plotted based on the retention time and the intensity of the compounds. This chromatogram is usually used for post processing or further analysis on the compounds or tested substances. The data acquired from the HPLC process is quantitative, and can be stored as records in database for storage, matching and further analysis.

In pharmaceutical research industries, HPLC is one of the most demanded and highly used instruments. This industry is estimated to worth about USD 400 billion and increasing every year justifying researchers in the field demanding for higher and better technology. In one pharmaceutical research area, HPLC has been used to analyse consumer products such as perfume, coloured dyes and polyvinyl chloride