Sudan University of Science and Technology

College of Graduate Studies

Automation of Crude Oil Storage Tanks Changeover mode in Molleeta Field

أتمتة نمط تحويل خزانات تخزين النفط الخام في حقل موليتا

A thesis submitted in partial fulfillment to the requirement for the M.Sc degree in Electrical Engineering (Control)

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قال تعالى:-

{ وَيَسْأَلُونَكَ عَنِ الرُّوحِ قُلِ الرُّوحُ مِنْ أَمْرِ رَبِّي
وَمَا أُوتِيتُم مِّن الْعِلْمِ إِلاَّ قَلِيلاً }

صدق الله العظيم

(الإسراء : 85)

Dedication

To my father

To my mother

To the limit that I can't thank them enough

To my sisters and brothers

To A. . Amir Ahmed Dawood

To my friends

MAGDI

Acknowledgement

Great thank s to Allah the almighty for giving me health, strength and patience to do my research..

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Abstract

Most automation systems are spread through the branches of work. Specially in industry, accurate different kinds of costs can be reduced, beside high quality and quantity of production.

Thus, the research aims to introduce the application of programmable logic controller (PLC) to control crude oil storage tanks change over mode by using eight motor operating valves (MOVs) , booster pump , water draw off pump, and four level sensors.

After developing and loading the program into the (PLC), the system was simulated and modeled using soft-ware simulator provided by (Siemens) and Supervisory Control And Data Acquisition (SCADA) system , and finally the system was performed in real world.

This project consists of six chapters, Chapter one introduces problem statement & proposed solution, approach & expected results. Chapter two explains process description . Chapter three introduces level measurement techniques. Chapter four introduces PLC in general . Chapter five explains Soft-ware design. Finally . Chapter six the conclusion & recommendation

مستخلص البحث

أخذ نظام الأتمتة انتشارا " واسعا" في العديد من المجالات وخاصة الصناعة بشتى أنواعها المختلفة .وذلك لأنه يمتاز بدقه عمل متناهية،تكلفه أقل بالاضافه إلي ألجوده والنوعية العالية من الإنتاج.

يهدف هذا البحث لتقديم تطبيق يوضح كيفية استخدام المتحكم المنطقي القابل للبرمجة(PLC) للتحكم في خزانات الزيت ، ذلك باستخدام ثمانية صمامات كهربائية و طلمبتين وأربعه محساسات للتحكم في مستوي الزيت وبعد تنفيذ وتحميل البرنامج في المتحكم المنطقي القابل للبرمجة ، تمت عملية محاكاة للنظام وذلك باستخدام (Soft-ware Simulator) إنتاج شركة (Siemens) SCADA ومن ثم تنفيذ هذا النظام علي أرض الواقع.

هذا البحث يحتوى على ستة فصول ،الفصل الأول المشاكل والاقتراحات للحلول مع النتائج المتوقعة مستقبلا" ،الباب الثاني يصف العملية الصناعية ،الفصل الثالث تقنيات قياسات مستوى السوائل ،الفصل الرابع المتحكم المنطقي القابل للبرمجة (PLC) عموما" ،الفصل الخامس التصميم بإ استخدا م (PLC) و(Siemens) SCADA ،وأخيرا" الفصل السادس يحتوي على الخلاصة والتوصيات .

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List of Abbreviation

PLC	Programmable Logic Controller
SDV	Solenoid Valve
FPF	Field Production Facilities
OGM	Oil Gathering Manifold
MFM	Multiphase Flow Meter
BS & W	Base Sediment & Water
PCV	Pressure Control Valve
LCV	Level Control Valve
T_I	Temperature Indicator
V/S	Versus
MOV	Motor Operating Valve
NPSH	Net Positive Section Head
FCV	Flow Control Valve
TIC	Temperature Indicator Controller
TV	Temperature Valve
PVSV	Pressure Vacuum Safety Valve
LAHH	Level Alarm High High
FSF	Field Surface Facilities
RF	Radio Frequency
RADAR	Radio Detection And Ranging .
BCD	Binary Coded Decimal
TDR	Time Domain Reflectometery
PID	Proportional Integral Derivative
ESD	Emergency Shut Down
MODICON	Modulator Digital Controller
MAP	Manufacturing Automation Protocol
I/O	Input / Output
CPU	Centeral Processing Unit

LVDT	Linear Variable Differential Transformer
DC	Direct Current
AC	Alternate Current
SFC	Sequential Function Chart
HHS	High High Switch
HS	High Switch
LLS	Low Low Switch
LS	Low Switch
S7-200	Step Seven – 200
DCS	Distributed Control System
SCADA	Supervisory Control And Data Acquisition