

## بسم الله الرحمن الرحيم

﴿٣٠﴾ وَعَلَّمَ آدَمَ الْأَسْمَاءَ كُلَّهَا ثُمَّ عَرَضَهُمْ عَلَى الْمَلَائِكَةِ فَقَالَ أَنْبِئُونِي بِأَسْمَاءِ هَؤُلَاءِ إِنْ كُنْتُمْ صَادِقِينَ ﴿٣١﴾ قَالُوا سُبْحَنَكَ لَا عِلْمَ لَنَا إِلَّا مَا عَلَّمْتَنَا إِنَّكَ أَنْتَ الْعَلِيمُ الْحَكِيمُ ﴿٣٢﴾ قَالَ يَتَذَكَّرُ أُنِيَّهُمْ بِأَسْمَائِهِمْ فَلَمَّا أَنْبَأَهُمْ بِأَسْمَائِهِمْ قَالَ أَلَمْ أَقُلْ لَكُمْ إِنِّي أَعْلَمُ غَيْبَ السَّمَوَاتِ وَالْأَرْضِ وَأَعْلَمُ مَا تُبْدُونَ وَمَا كُنْتُمْ تَكْتُمُونَ ﴿٣٣﴾

## صدق الله العظيم

## ***Dedication***

**To...**

**The Soul of My Father**

**My Mother**

**My Brothers**

**My small family**

**My Friends**

## ***Acknowledgment***

*Firstly, I would like to praise to Allah who gave me health, strength and patience to fulfill this work.*

*Secondly, there are many people who I want to thank for the encouragement and support, **USTAZ/Abdallah Salih** as my teacher and advisor; he has been of great help. My project would not be what it is without him.*

*I am indebted to: Prof. Shamboul, Prof. Saad, Dr. Eisa, Dr. Ahmed Khalied and Dr. Ahmed Imam. Your teaching certainly will never be forgotten, and I will apply the knowledge I learned from you.*

*Finally, I would like to thank my colleges Mustafa, Omer and Mohamed. Words cannot describe how grateful I am to these three for all the support they have provided me since I started my graduate study.*

## Abstract

The turbine protection system protects the turbine from over speeding, monitors all critical turbine parameters, and trips the turbine if a condition exists that could cause equipment damage.

The aim of this research is to use Programmable Logic Controller to protect steam turbines with capacity of 30 Mega watts in Khartoum North Power Station by using Siemens S7-300 controller,

The existing turbine protection circuit consists of relays, contactors and resistor, and it operates more than 25 years. it has Only one common alarm for turbine trip, the alarm not define which circuits is tripped and which condition is occurring .This lead the maintenance and the troubleshooting of the circuit takes long time to define the cause of the trip signal and Also there is lack of spare parts.

The existing trip signals are condenser water level extra high, condenser vacuum low, lubrication oil to bearing pressure low and electrical trip signal from generator protection this signal are digital signal.

Additional analog signal added using the existing signal for turbine over speed, lube oil bearing temperature, bearing vibration and generator winding temperature.

The software was written for Siemens S7 300 PLC using ladder logic language. And it consist an alarm for turbine trip and another one to define which signal cause the trip. Then it simulated by PLCsim.

## □□□□

نظام حماية التوربينه يحمي التوربينه من السرعه العاليه ,ويراقب كل الحالات الحرجه ويوقف التوربينه اذا كان حاله تؤدي الي تلف المعده.  
إن الهدف من البحث هو استخدام التحكم المنطقي المبرمج لحماية توربينات بخارية بسعة 30ميغاواط في محطه بحري الحراريه, باستخدام متحكمات شركه سيمنز S7 300.

دائرة الحماية الحاليه تتكون من المرحلات و الملامسات والمقاومات وهي تعمل لأكثر من 25عام. وتوجد بها إشارة إنذار وحيد توضح إن التوربينه توقفت عن العمل ولكنها لا توضح سبب التوقف. وهذا يؤدي الي ان الصيانة وتحديد الاعطال للدائره ياخذ وقت طويل لتحديد السبب, وايضا هناك شح في قطع الغيار.  
إشارات الحماية الحاليه تتمثل في مستوي الماء في المكثف عالي جدا, انخفاض ضغط المكثف, وانخفاض ضغط الزيت في الحوامل وإشارة عند فصل المولد. وهي إشارات رقيه.

تمت الاستفادة من بعض الإشارات التماثلية الموجهة لزيادة الحماية للعنفه والإشارات هي السرعه العاليه التوربينه, درجة حرارة الزيت في الحوامل, الاهتزازات في الحوامل ودرجة حرارة الأوجه في المولد.  
تمت كتابه برنامج بلغه السلم لمتحكمات شركه سيمنز S7 300. وبه إشارات توضح إن التوربينه توقفت عن العمل وسبب توقفها. ومن ثم تمت تجربته محاكاة الدائره.

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