

## الاستهلال

بسم الله الرحمن الرحيم

قال تعالى

(وقل إعملوا فسيرى الله عملكم ورسوله والمؤمنون وستردون الى

عالم الغيب والشهادة فينبئكم بما كنتم تعملون )

صدق الله العظيم

سورة التوبة الاية (105)

## DEDICATION

*Each challenging work needs to self-efforts as well as guidance of elders especially those who were very close to our heart.*

*My humble effort dedicates to my sweet and loving*

MOTHER AND FATHER

*Whose affection, love, encouragement and pry days nights make me to able to get such success and honor, Along with all hard working and respected teachers.*

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# **ABSTRACT**

The aim of this study is to develop a Boom motion model of the hydraulic system of an Excavator. Excavator hydraulic system components are modeled and analyzed in the same environment using the physical modeling toolboxes inside the commercially available simulation software MATLAB/Simulink interaction between the nodes and response of the hydraulic system are obtained by co-operating the hydraulic analyses variables such as pressure flow and displacement are measured on a physical machine and then compared with the simulation results.

Two simhydraulic model was found, boom raising in high speed and the other is the boom normal raising; boom normal lowering.

The compared between the required values and simulation results was found, the errors between the simulation results and real values was found and the maximum error in simulation result is 40% in cylinder pressure in Boom raising of high speed.

## مستخلص

الهدف من هذه الدراسة هو نمذجة الحركة الهيدروليكية لليوم في الحفار وذلك بتحليل و نمذجة مكونات النظام الهيدروليكي في نفس البيئة وذلك باستخدام النمذجة الفيزيائية داخل برنامج المحاكاة. وعن طريق تشغيل النظام الهيدروليكي وذلك بعمل نمذجة لمكونات النظام الهيدروليكي تم الحصول على نتائج لمقياس الضغوطات ومعدلات السريان للمائع والازاحه لليوم. تم عمل نمذجة لكل حركات اليوم من خلال مخطتين وهما الأول الرفع عند السرعة العاليه والثانى السرعة الاعتيادية الرفع والنزول . كما تم مقارنة النتائج المتحصل عليها بواسطة النمذجة والقياسات الموجوده فى الكتب (الكتلوجات) وتم إستخراج النسبه المئوية للفرق (الخطأ) بين القياسين وكانت أعلى نسبة هى نسبة الضغط فى الاسطوانه وتساوى 40% وهى فى حالة الرفع عند السرعة العاليه.

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## LIST OF SYMBOLS AND ABBREVIATIONS

## SYMBOLS:

Symbols	Description	Unit
$A_{leak}$	Closed valve leakage area	$m^2$
$x$	Control member displacement	$m$
$x_{max}$	Control member maximum stroke	$m$
$Re_{cr}$	Critical Reynolds number	—
$C_D$	Flow discharge coefficient	—
$\rho$	Fluid density	$kg/m^3$
$\mu$	Fluid dynamic viscosity	$N.s/m$
$\nu$	Fluid kinematic viscosity	$cSt$
$A_{max}$	Fully open valve passage area	$m^2$
$k_{HP}$	Hagen-Poiseuille coefficient	—
$A(p)$	Instantaneous orifice passage area	$m^2$
$p_A, p_B$	Gauge pressures at the block terminals	$kpa$
$P_P, P_T$	Gauge pressures at the block terminals	$kpa$
$k_{leak}$	Leakage coefficient	—
$q_{leak}$	Leakage flow	$m^3/s$
$p_{cr}$	Minimum pressure for turbulent flow	$kpa$
$\rho_{nom}$	Nominal fluid density	$kg/m^3$
$\nu_{nom}$	Nominal fluid kinematic viscosity	$cSt$
$\omega$	Pump angular velocity	$rad/s$
$P$	Pressure differential across the pump	$kPa$
$q$	Pump delivery	$m^3/s$
$D$	Pump instantaneous displacement	$m$
$D_{max}$	Pump maximum displacement	$m$
$\eta_{mech}$	Pump mechanical efficiency	—
$\omega_{nom}$	Pump nominal angular velocity	$rad/s$
$P_{nom}$	Pump nominal pressure	$kpa$
$\eta_V$	Pump volumetric efficiency	—
$p_{reg}$	Regulation range	$kpa$
$T$	Torque at the pump driving shaft	$N.m$
$D_H$	Valve instantaneous hydraulic diameter	$m$
$p_{max}$	Valve pressure at maximum opening	$kpa$
$p_{set}$	Valve preset pressure	$kpa$

## **ABBREVIATIONS**

P R V: PRESSURE RELEIF VALVE

D C V: DIRECTION CONTROL VALVE