Sudan University of Science and Technology

College of Engineering

School of Mechanical Engineering – Department of Production Engineering

A Thesis submitted for the Honor Degree of BACHELOR of mechanical Engineering of
Sudan University of Science & Technology

Title:

Compensating Frequency Change using DC Static Voltage On Electrostatic Actuator

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August 2014

Contents

Page

Title.....I
Acknowledgement.....II
Content.....III
List of Figures.....V
List of Tables.....VI
List of Abbreviations.....VII
Abstract.....VIII
Chapter One (Introduction) 1
1.1. Introduction ……..2
1.2. Research problem.....2
1.3. Objectives.....2
1.4. Methodology…….2
Chapter Tow (Theoretical background& Literature review) 3
2.1. Introduction to MEMSor MST.....4
2.1.1. Micromachining……..…4
2.2. Applications of MEMS..... 5
2.3. Actuator.....7
2.3.1. Electrostatic actuators.....7
2.4. Material of actuator……7
2.4.1. Silicon…….7
2.4.2. Silicon dioxide…….……8

2.5. Finite element method (FEM).....8

2.5.1. Coupled-field analysis.....8

2.6. ANSYS.....9

2.7. Literature review.....9

2.7.1.Accurate fully-coupled natural frequency shift of mems actuatorsdue to voltage bias and other external forces…….……..9

2.7.2.Innovative MEMS Voltage-to-Frequency Converter using Cascaded Transducers……..……..12

2.8. Conclusion.....13

Chapter Three (Actuator design) 14

3.1. Introduction.....15

3.1.1. Base layer.....15

3.1.2. Isolator layer.....15

3.1.3. Actuator layer.....15

3.1.4. Pad layer.....16

3.2. The programming.....16

3.2.1. Pre process.....16

3.2.1.1. Element type.....16

3.2.1.2. Material properties defining.....16

3.2.1.3. Geometry.....17

3.2.1.4. Mesh.....18

3.2.1.5. Load definition.....19

3.2.2. Process.....20

3.2.3. Post process.....20

3.3. The flow chart.....21
3.4. Model validation.....21

Chapter Four (Results review and analysis)24
4.1. Introduction.....25
4.2. Charts.....29
Chapter Five Conclusion & Recommendation) 31
5.1. Conclusion.....32
5.2. Recommendations.....32
5.3.References.....33

List of Figures

Page

Figure2.1.Shape of 1st mode of resonance (top), 2nd mode of resonance (bottom)……10

Figure 2.2.Frequency response due to voltage loads for structure……11
Figure 2.3.Simulation of a beam cantilever.....12
Figure 3.1.Geometry drawn for electrostatic actuator……18

Figure 3.2.Mesh of electrostatic actuator……19

Figure 3.3.Geometry with loads.....19
Figure 3.4.Flow chart.....20
Figure 3.5.Resonance frequency by ANSYS.....22

Figure 4.1.Natural frequencyofmodel……..25
Figure 4.2.Frequency value from applied AC voltage……25
Figure 4.3.Frequency value from applied DC voltage……25

List of Tables

Page

Table 2.1.Applications of MEMS.....5
Table2.2.Displacements at four cantilever distances with three applied voltage…….13
Table 3.1.Material properties.....17
Table 4.1.The relationship between voltage and frequency response.....27
Table 4.2.Frequency value of different value of voltage……28

List of Abbreviations

MEMS	Micro-Electro-Mechanical System
FEM	Finite Element Method
FEA	Finite Element Analysis
ANSYS	Analysis System
NT	New Technology
AFM	Atomic Force Microscope
DC	Direct Current
AC	Alternative Current
MST	Microsystems Technology
SOI	Silicon On Insulator
VFC	Voltage-to-Frequency Converter

Abstract

Electrostatic actuators have major role in many MEMS devices, e.g. sensors, actuators. The amount of applied voltage to an electrostatic actuator has a direct impact on frequency throughout the actuator. This research aims to study the compensating frequency by using pressure equivalent to thevalue of thedirect voltage through Electrostatic actuatorin a micro-cantilever. Finite element method, ANSYS, was used as a simulation tool.

المستخلص

للمحرك الإلكتروستاتيكي دوراً هاماً في كثير من الانظمة الكهربائية الميكانيكية متناهية الصغر على سبيل المثال الحساسات والمحركات. لمقدار فرق الجهد المسلط على المحرك تأثير مباشر على التردد خلال المحرك. هذا البحث يهدف لدراسة ضبطية التردد عن طريق استخدام الضغط المعادل لقيمة فرق الجهد المباشر خلال محرك إلكتروستاتيكي (على شكل كابولي) مصغر. تم إستخدام طرق التحليل المحدود للعناصر ممثله في برنامج انسيس كوسيلة للمحاكاة.

1.1. Introduction:

Electro statically actuated cantilever beam is a base component in low frequency MEMS filters. The cantilevers are used in electrical sensors. The purpose of research is compensating frequency change using DC voltage on electrostatic actuator by applying MEMS technology and simulating by ANSYS program.

1.2. Research Problem:

When production actuators are set to a specific frequency with adding AC voltage, In some cases, for reasons manufacturing occurring difference in the values of frequencies actuators. In order to change the frequency we have to change the actuator.Instead of changing the actuator can change the frequency and control its value by DC voltage.

1.3. Objective:

This research aimed to study:-

1. The effect DC voltage to frequency value.

1.4. Methodology:

NO	ASSIGNMENTS	Duration in weeks	DATE from___to
1	Studying ANSYS course	3	2013/11/28——16
2	The model design	2	2013/12/21——8
3	Mid term exams	5	2014/1/15———22
4	Mid term holyday	2	2014/2/15———16
5	Model tests & model modification	1	2014/2/22——16
6	Out put analysis	2	2014/3/8———23
7	Final forming	3	2014/3/29——9
8	Dead line		2014/5/15