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and Scientific Research
University of Baghdad
AL-Khwarizmi College
of Engineering



AL – KHWARIZMI ENGINEERING JOURNAL



**Summaries of Scientific Research
Projects for Graduate Students In
Automated Manufacturing
Engineering Department
2011 - 2012**

E-mail:- kecbu@yahoo.com

Website:- www.kecbu.net

Student Graduate Projects Ministry of Higher
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**Summaries of Scientific Research Projects for
Graduate Students in Automated Manufacturing
Engineering Department
2011-2012**

Directed by

Prof. Dr. Nabeel K. Abid AL-Sahib
Dean Al-Khwarizmi College of Engineering

Supervised by

Dr. Ali Husain Kadhum
Head of the
Automated Manufacturing Department

Prepared by

Yahya Mohey Hamad
Department Convener

Introduction :-

In order to accommodate the rapid contemporary scientific development and to achieve advanced quality in higher education, engineering education has recently been extended to include many specific modern fields. The most important application was Automated Manufacturing Engineering (A.M.E).

Because of the country's need for engineers in this modern field of specialization. The aims of the department are to prepare graduates capable of dealing with the great developments occurred in the field of computers and make use of it in designing and manufacturing operations (CAD& CAM) and capable of dealing with computer numerical controlled machines (C.N.C.). The department also prepare graduates capable of designing production lines, planning for more qualified technologies and optimum use of available resources in order to improve product quality and increase product quantity, decrease the cost as well as the optimum choice of materials product manufacture. Participate in introducing this field of specialization in Arab countries, if we look through internet sites of some Arab countries, it could be seen that their engineering colleges lack this modern field of specialization, so Al-Khwarizmi College of Engineering is one of the leaders in the Arab land.

Many students projects have been conducted in the field of the department and these projects participated in many students conferences and scientific festivals in the college and also in other participations like the sovereignty conference by the Ministry of Youth and Sport on behalf of the Iraqi Prime Minister. One of the projects participated in the scientific conference in Qatar and obtained high rank in this conference. A set of projects conducted every year by the staff of the department with the students and the projects introduced and listed in this journal give a good example in this field that cover many scientific fields containing the theoretical and applied fields.

**Dr. Ali Husain Kadhum
Head of the Department
2011-2012**

Academic Staff of Automated Manufacturing Engineering Department



Dr. Osama Fadhil



Dr. Ali Husain



Dr. Ahmad Zeadan



Dr. Faiz Fauzi



Dr. Hamed Salih



Msc. Sanaa Numan



Dr. Kareem Neamah



**Dr. Amer Abd Al
Munem**



Msc. Kamal Aati



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Msc. Haider Raheem



**Msc. Izzat Abid
AL-Razzak**



Msc. Nazar Kais



Msc. Zaid Rassim



Msc. Raghad Ahmad



Msc. Thamer Harith



Msc. Wael Hekmat

Academic Staff of Automated Manufacturing Engineering Department

mail: - kecbu@yahoo.com

Website: - www.kecbu.net

Student Graduate Projects 2011-2012

	Project Name	Supervisor Name	Student Name
1	Charpy Impact Value of Friction Stir Welded 2024 Aluminum Alloy at Different Tool Rotation and Transverse Speeds	Dr. Kareem N. Salloomi	1- Revan Muhssin 2- Sarah Kassim
2	New design & manufacturing of magnetic abrasive machine	Dr. Ali Hussain M.Sc. Nazar Qais	1- Ayman Hadi 2- Reem Naufal
3	The influence of cutting parameters on surface finish in turning operation	Dr. Osamah F. Abdulateef	1- Ali Ahmed Abdalula
4	Programing ATMEL Microcontroller to Control 5-Axes Industrial Robot With Simulation By MATLAB	M.Sc. Izzat. Abid. AlKareem	1- Hussein A. Al-Amili 2- Israa Qassim
5	Investigation the Rolling Process Conditions That Effect on the Geometrical Surface Finishing Of Products by Using Neural Network	M.Sc. Kamal Ati Amwead	1- Yasamin Ahmed Abd Al-Rahman 2- Bassma Sabah Majeed
6	Investigating the Materials Characteristics that Effect on the Geometrical Surface Finishing with Forming Processes	M.Sc. Hayder R. Zghair	1- Marwa Raheem Kamel 2- Sabah Mahmood Ayooob
7	Design and Manufacturing Wind Turbine Generator	Dr. Enas A. Khaled	1- Sahar Yousif Azeez 2- Duha Qais Deely
8	Design and Manufacturing of Filament Wound Composite Tubes	Dr. Faiz Fauzy Mustafa M.Sc. Zaid R. Mohammad	1- Bilal Saad Adel 2- Ali Salem Asad

Student Project Paper for Final Class

University of Baghdad	Al- Khwarizmi College of Engineering	Automated Manufacturing Department.	Project Index: 1	Date: 1 ^V -5-2012
Project Name	Charpy Impact Value of Friction Stir Welded 2024 Aluminum Alloy at Different Tool Rotation and Transverse Speeds			
Students Names	1- Revan Muhssin		2- Sarah Kassim	
Supervisor Name	Dr. Kareem N. Salloomi		Field: Applied Mechanics	

The Aim of the Project

The aim of the present research was to study the effect of the Friction Stir Welding process parameters (Tool Rotation and Transverse Speeds) on the microstructure and impact toughness of the 2024 Aluminum Alloy.

Project Summary

In this work, the effect of friction stir welding parameters such as tool rotation and tool transverse speed on the impact value of 6.5mm thick weldment of aluminum alloys 2024 – T3 has been studied and investigated. Three tool rotation speed and three tool transverse speed were selected for the friction stir welding. The resistance of weldment to sudden loading has been investigated using the Charpy impact test with standard V – notched specimens at room temperature.

Discussion

It has been observed during this work that the total impact energy increased in the friction stir welding of (medium strength) 2024 Al alloy at 580 rpm and 102 mm/min with respect to the base metal.

Any Suggestions for Future Developments

One of the most important suggestions for future development is to study more pin shapes effect on impact energy in order to select the optimum shape that gives high impact strength.

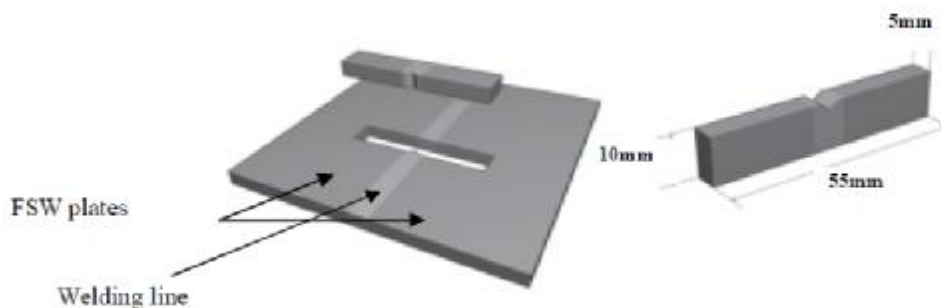
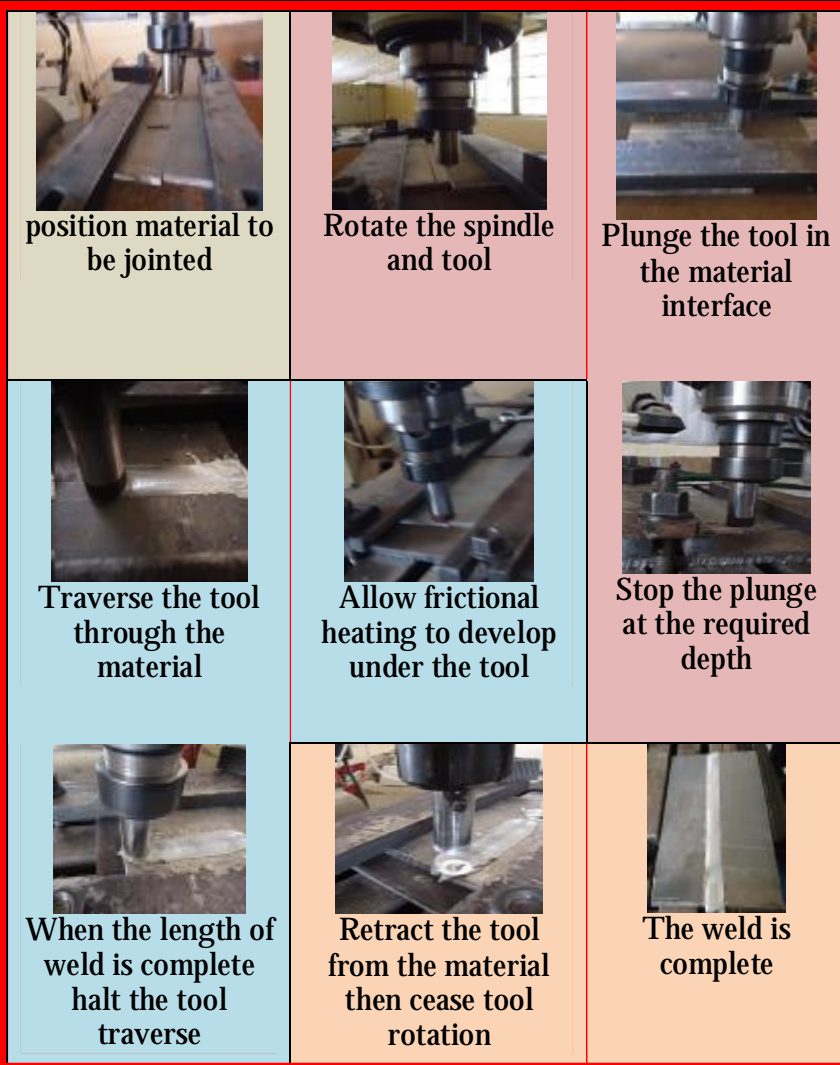


Figure (1) Scheme of the machining of the V-notch Charpy specimens from the FSW plates and dimensions of the sub-size specimens used in this work.

Student Project Paper for Final Class

University of Baghdad	Al- Khwarizmi College of Engineering	Automated Manufacturing Department.	Project Index: 2	Date: 1 ^V -5-2012
Project Name	New design & manufacturing of magnetic abrasive machine			
Students Names	1- Ayman Hadi		2- Reem Naufal	
Supervisor Name	1- Dr. Ali Hussain 2- M.Sc. Nazar Qais		Field: Machine building technology and automation	

The Aim of the Project

Our project was to design & build a machine that performs polishing on a work piece by using an abrasive powder that is controlled by a magnetic field, therefore; the whole process is called Magnetic abrasive polishing. The aims of our research are as follows:

- To find the proper abrasive grains and the technological parameter for the magnetic abrasive polishing of shafts.
- To examine the possibility of MA burnishing of softer work pieces.
- To develop the magnetic aided technology and machine deburring and cleaning of small, delicate work pieces.

Project Summary

Our design of the M.A.P machine was biased on the behavior & the characteristics of the M.A.P process , the machine was designed & built at the Mechanics lap of the Manufacturing operations department , Al-Khwarizmi collage of engineering .

Using a lath machine, which have provided the mechanism to accomplish the process, since our project is dedicated to polish cylindrical parts mostly; therefore a lath machine was a perfect to start with.

Fixing the core & DC motors on the carriage of the lath machine, doing that has enabled us to use the linear motion of the carriage in our favor and use it for the benefit of the process. Since our process is accomplished by three motions, rotation of the work piece, rotation of disks, and linear motion of the core, choosing a lath machine as a base component for our design was a good call, since it has provided us with primary motions that we need.

Discussion

The two power supply is used for the Electromagnetic inductors, to regulate the amount of current & voltage that they consume & control the electromagnetic flux. The electromagnetic inductors, the core, the disks& their motors are all carried by the lath machine carriage; the linear motion of the carriage is also achieved by the AC motor, which is connected, through a pulley, to a gearbox, which will control the speed of the carriage.



Student Project Paper for Final Class

University of Baghdad	Al- Khwarizmi College of Engineering	Automated Manufacturing Department.	Project Index: 3	Date: 1 ^V -5-2012
Project Name	The influence of cutting parameters on surface finish in turning operation			
Students Names	1- Ali Ahmed Abdalula	2-		
Supervisor Name	Dr. Osamah F. Abdulateef	Field: Applied Mechanics		
<u>The Aim of the Project</u>				
Study the effect of cutting parameters on the surface roughness and hardness of the machined surfaces.				
<u>Project Summery</u>				
Three cutting parameters (feed rate (f), depth of cut (d), and cutting speed (v)) have been used with three different types of work piece materials, to reduce the manipulation and help to arrive at proper improvement plan of the manufacturing process & Techniques.				
<u>Discussion</u>				
Turning is a very important machining process that usually used for obtained the best surface finish and hardness of metals ,so the important to know the cutting parameters such as feed rate ,depth of cut,& cutting speed during machining,, which help to arrive to proper machining conditions for metals and how to get it without further working .				
<u>Any Suggestions for Future Developments</u>				
Adding the another cutting parameter(Temperature , angle of cutting)				



Shaft after machining

Student Project Paper for Final Class

University of Baghdad	Al- Khwarizmi College of Engineering	Automated Manufacturing Department.	Project Index: 4	Date: 1 st -5-2012
Project Name	Programing ATMEL Microcontroller to Control 5-Axes Industrial Robot With Simulation By MATLAB			
Students Names	1- Hussein A. Al-Amili		2- Israa Qassim	
Supervisor Name	M.Sc. Izzat. Abid. AlKareem		Field: Mechatronics	

The Aim of the Project

- Controlling servo-motors (robot's joints) by using Microcontroller with C-language package.
- Programming and controlling industrial robot.
- Derive the kinematic equation of 5-axes robot arm (forward and inverse).
- Simulation by MATLAB to analysis the Kinematics of robot arm.
- Image processing for measuring dimensions.

Project Summery

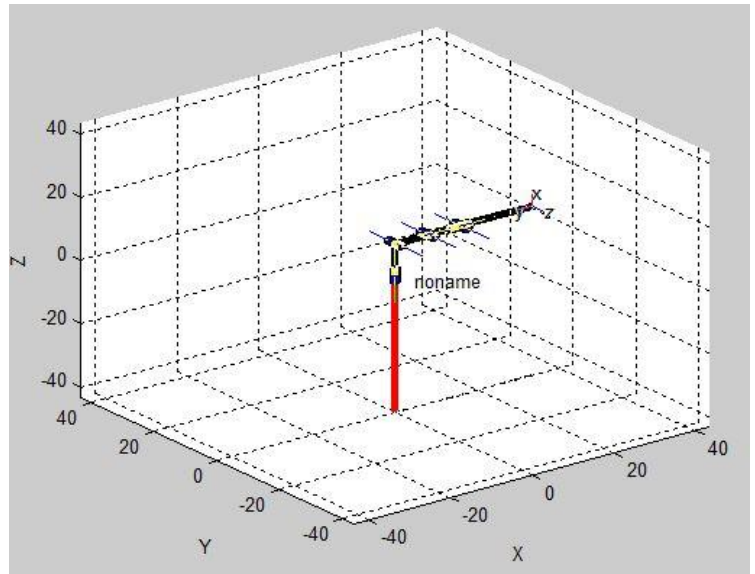
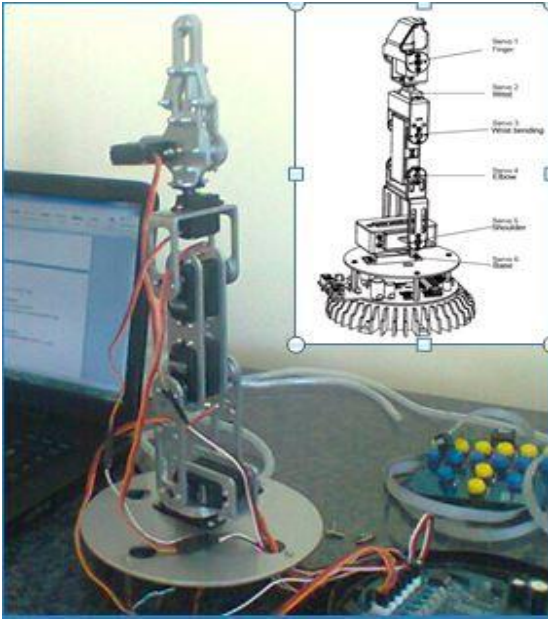
The hardware of the robot has five joints each joint is controlled by a servo motor. In this project This Robot is controlled from a microcontroller with C language in addition of a SIMULATION of it with MATLAB also. The robot is controlled from an embedded system. The user can use the software packages to program the Atmel microcontroller to control a 5-axes robot arm.

Discussion

- Embedded system included Microcontroller is an effect way to control robot movement instead of computer
- The results of kinematic analysis with MATLAB Simulation were with a good accuracy compared to the real measurement
- The product dimensions can be detected with good results, less effort and cost using camera
- The gripper joint is the motor with high current consumption that have to be considered when select the motor in design process.

Any Suggestions for Future Developments

- adding sensors of force, ultrasonic, and inertial to the robot
- This project can be developed to a mobile robot to detect bombs.



Baghdad University
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 Automated Manufacturing Dept.
5-Axis Robot Arm Manipulator
 By: Hussein A. Al-Amili & Israa Qassim
 Supervisor
 Izzat A. Al-Darraj

Measuring Current

All Servo 1 Servo 2 Servo 3
 Servo 4 Servo 5 Servo 6

Camera

Camera

Robot Kinematics

Link	Alpha l	a l	Theta l	d l
1	-pi/2	8		10
2	0	8		0
3	0	8		0
4	-pi/2	0		0
5	0	0		17.4

Forward kinematics Inverse Kinematics

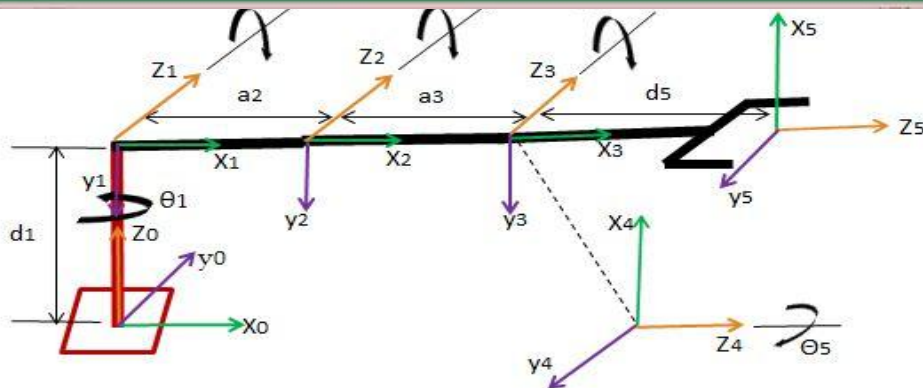
Plot Robot

Distance, Velocity & Acceleration

Theta1	Theta2	Theta3	Theta4	Theta5	Select interval
Initial					t initial Step t final
Final					

Plot joint q Plot joint v Plot joint a
 Calculate joint q Calculate joint v Calculate joint a

close all



Student Project Paper for Final Class

University of Baghdad	Al- Khwarizmi College of Engineering	Automated Manufacturing Department.	Project Index: 5	Date: 1 ^V -5-2012
Project Name	Investigation the Rolling Process Conditions That Effect on the Geometrical Surface Finishing Of Products by Using Neural Network			
Students Names	1-Yasamin Ahmed Abd Al-Rahman	2- Bassma Sabah Majeed		
Supervisor Name	M.Sc. Kamal Ati Amwead		Field: Vibration and Acoustic Engineering	

The Aim of the Project

1. Construction of a mathematical model for rolling process.
2. Construction of computer program to calculate (contact angle (angle of bite), the maximum of the angle of bite, draft, the maximum of the draft, reduction, plot the pressure distribution in the roll gap (friction hill), roll forces, Maximum Rolling Pressure in the neutral point and Determination of the neutral point).
3. Analysis the data by using another method such neural networks technique to enhance the ability of perdition system.

Project Summery

This work deals with theoretical treatment of cold rolling than for any other metalworking process. It aims to build mathematical model to study the dimensionless theoretical pressure distribution in the roll gap using the slab method of analysis for plane strain. The project covers the coefficient of friction between the strip and rolls. A variety of lubricants .Also the study includes the effects of the reduction ratio of strip, and the radius of the roll on the dimensionless theoretical pressure distribution in the roll gap (friction hill).

Discussion

The results represented in this study are obtained by FORTRAN program. The results show good agreement between the two programs (Visual Basic – 6 and FORTAN). As a conclusion, artificial neural network provided better accuracy to predict peak pressure and neutral point position in cold rolling process. Moreover, is it also concluded that pressure distribution in the roll gap as a function reduction in thickness. Note the increases in the area under the curves with increasing reduction, thus increasing the roll force. As reduction increases, the length of contact in the roll gap increases, which in turn increases the peak pressure.

Any Suggestions for Future Developments

One of the most important suggestions for future development is to predication of minimum power in the cold rolling process using neural network. also study the shear stress distribution in the roll gap by artificial neural network.

Section of Material & Temperature of working

Material of metal working
 Aluminum 1100-O
 Aluminum 2024-T4
 Aluminum 6062-O
 Aluminum 6061-O
 Aluminum 6061-TE
 Aluminum 7075-O
 Magnesium annealed
 Steel Low carbon annealed
 Steel 1112 annealed
 Steel 4130 annealed
 Steel 4340 annealed
 Steel 17-4 PH annealed
 Steel 302 stainless, annealed
 Steel 304 stainless, annealed
 Steel 310 stainless, annealed

Typical Values For K and n At Room Temperature
 Values of K and n for a variety of engineering materials
 Values of K and n
 Strength Coefficient (K) MPa
 Strain-hardening exponent (n)

Temperatures
 Melting point °C
 Recrystallization Temperature °C
 Temperature of Working °C

Types of Rolling
 The types of rolling applied on work to produce T or know the types of rolling process. Types
 Cold Rolling
 Hot Rolling

Dimensional Data & Coefficient of Friction (C.O.F: 0.05-0.1)

Width mm
 Initial Thickness mm
 Final Thickness mm
 Draft mm
 Roll Radius mm
 Coefficient of friction

Compute

Result
 Draft mm
 Max. of Draft mm
 Reduction %
 Length of Contact mm
 Angle of Contact Deg.
 Max. of Angle of Contact Deg.
 True Strain

Roll Force

Table of Values

Value	Units
Rolling Force	MPa
Rolling Torque	MPa
Rolling Power	HP
Rolling Energy	J

Rolling Force: MPa
 Rolling Torque: MPa
 Rolling Power: HP
 Rolling Energy: J

Where H_c is the coefficient of friction
 Horizontal direction
 Vertical direction
 Diagonal direction

Friction Hills during the Cold Rolling

pressure distribution in the roll gap (Friction Hill)

solve

Correct Angle (Deg.)

Correct Angle (Deg.)	The dimensionless pressure distribution in the roll gap
0.0	1.0000000000
0.1	1.0000000000
0.2	1.0000000000
0.3	1.0000000000
0.4	1.0000000000
0.5	1.0000000000
0.6	1.0000000000
0.7	1.0000000000
0.8	1.0000000000
0.9	1.0000000000
1.0	1.0000000000
1.1	1.0000000000
1.2	1.0000000000
1.3	1.0000000000
1.4	1.0000000000
1.5	1.0000000000
1.6	1.0000000000
1.7	1.0000000000
1.8	1.0000000000
1.9	1.0000000000
2.0	1.0000000000
2.1	1.0000000000
2.2	1.0000000000
2.3	1.0000000000
2.4	1.0000000000
2.5	1.0000000000
2.6	1.0000000000
2.7	1.0000000000
2.8	1.0000000000
2.9	1.0000000000
3.0	1.0000000000
3.1	1.0000000000
3.2	1.0000000000
3.3	1.0000000000
3.4	1.0000000000
3.5	1.0000000000
3.6	1.0000000000
3.7	1.0000000000
3.8	1.0000000000
3.9	1.0000000000
4.0	1.0000000000
4.1	1.0000000000
4.2	1.0000000000
4.3	1.0000000000
4.4	1.0000000000
4.5	1.0000000000
4.6	1.0000000000
4.7	1.0000000000
4.8	1.0000000000
4.9	1.0000000000
5.0	1.0000000000
5.1	1.0000000000
5.2	1.0000000000
5.3	1.0000000000
5.4	1.0000000000
5.5	1.0000000000
5.6	1.0000000000
5.7	1.0000000000
5.8	1.0000000000
5.9	1.0000000000
6.0	1.0000000000
6.1	1.0000000000
6.2	1.0000000000
6.3	1.0000000000
6.4	1.0000000000
6.5	1.0000000000
6.6	1.0000000000
6.7	1.0000000000
6.8	1.0000000000
6.9	1.0000000000
7.0	1.0000000000
7.1	1.0000000000
7.2	1.0000000000
7.3	1.0000000000
7.4	1.0000000000
7.5	1.0000000000
7.6	1.0000000000
7.7	1.0000000000
7.8	1.0000000000
7.9	1.0000000000
8.0	1.0000000000
8.1	1.0000000000
8.2	1.0000000000
8.3	1.0000000000
8.4	1.0000000000
8.5	1.0000000000
8.6	1.0000000000
8.7	1.0000000000
8.8	1.0000000000
8.9	1.0000000000
9.0	1.0000000000
9.1	1.0000000000
9.2	1.0000000000
9.3	1.0000000000
9.4	1.0000000000
9.5	1.0000000000
9.6	1.0000000000
9.7	1.0000000000
9.8	1.0000000000
9.9	1.0000000000
10.0	1.0000000000

Neural point position: 1.0000000000
 The Peak Pressure: 1.0000000000

Student Project Paper for Final Class

University of Baghdad	Al- Khwarizmi College of Engineering	Automated Manufacturing Department.	Project Index: 6	Date: 1 ^V -5-2012
Project Name	Investigating the Materials Characteristics that Effect on the Geometrical Surface Finishing with Forming Processes			
Students Names	1- Marwa Raheem Kamel		2- Sabah Mahmood Ayoub	
Supervisor Name	M.Sc. Hayder R. Zghair		Field: Production Engineering	

The Aim of the Project

The work in this project aim to investigate the material characteristics that effect on geometrical surface finish with forming processes and in this project, the bending process has been taken as example of these processes and the effect of spring back on it for three metals (steel, copper, aluminum)

Project Summery

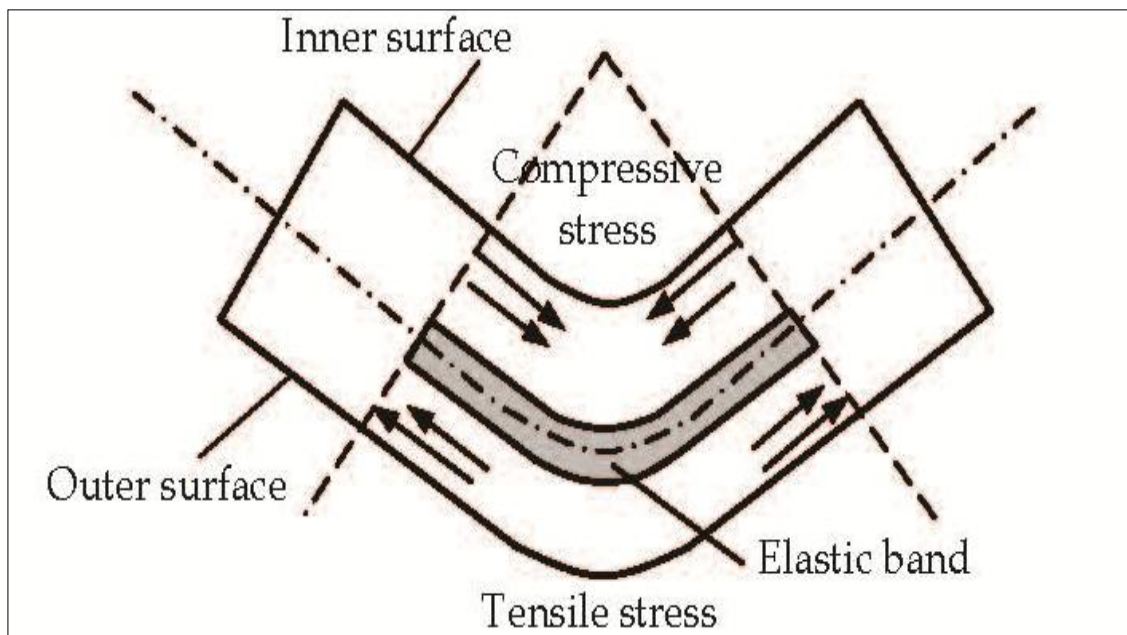
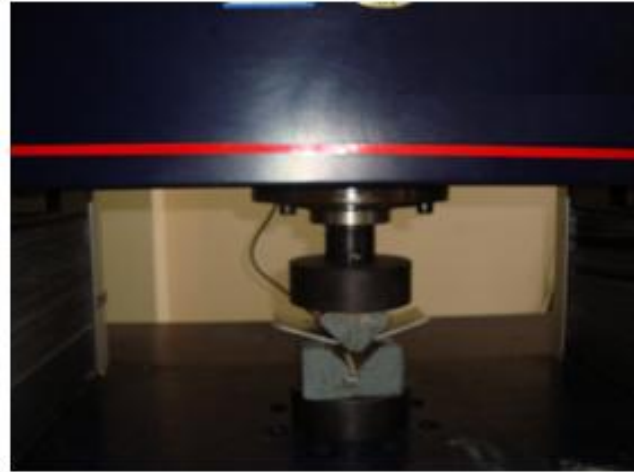
This project consists mainly of two parts, theoretical and experimental. In the experimental part, the investigations employed to verifying the spring back in bending forming process, this is due partly to its significance to many forming applications as well as cost and time limitations. The results that predicated in parameters of V – bending process, spring back factor (KS), sheet thickness (T), bend Radius (R), this validated through comparisons with two sets of experimental investigated, based on theoretical analysis by using (Microsoft Visual Basic 6.0) and testing analysis through three sets of experimental results by using V 90o die – bending tests, the theoretical part, based on set of equations for spring back phenomena.

Discussion

- ⊕ The engineering materials that featured of high ductility have high formability, low elastic recovery, so the final products have better geometrical specifications.
- ⊕ The engineering materials that featured of high strength have low formability, high elastic recovery, so more process will do to get symmetrical specifications, like over bending, other process as stretching.

Any Suggestions for Future Developments

The suitable choice of die and use material have high ductility in forming processes



Student Project Paper for Final Class

University of Baghdad	Al- Khwarizmi College of Engineering	Automated Manufacturing Department.	Project Index: 7	Date: 1 st -5-2012
Project Name	Design and Manufacturing Wind Turbine Generator			
Students Names	1- Sahar Yousif Azeez	2- Duha Qais Deely		
Supervisor Name	Dr. Enas A. Khaled	Field: Laser Engineering		

The Aim of the Project

The aim of this project is to design and manufacturing wind turbine generators to produce electricity by using wind energy.

Project Summary

This Project investigates wind energy system in general form which is part of renewable energy. This project concerned for designing and manufacturing wind turbine generators in order to generate the electricity and making a comparison between the voltage generated from wind turbine with wood blades and wind turbine with aluminum blades describing the efficiency of each design with respect to voltage generated from each wind turbine generator.

Discussion

The main steps of the project can be divided into the following :

- 1- Making all the required design calculations.
- 2- Producing the selected materials.
- 3- Manufacturing the main parts of the generator.
- 4- Assembling all parts to obtain the final shape of the wind generator.
- 5- Operating the system after fixing it in the proper place and obtain the generated voltage.

Any Suggestions for Future Developments

Planning for making the required improvement by increasing the generator scales or designing other methods in the field of renewable energy.



Fig.(3.1) wind turbine at AL-Khwarizmi collage of engineering

Student Project Paper for Final Class

University of Baghdad	Al- Khwarizmi College of Engineering	Automated Manufacturing Department.	Project Index: 8	Date: 1 st -5-2012
Project Name	Design and Manufacturing Of Filament Wound Composite Tubes			
Students Names	1- Bilal Saad Adel	2- Ali Salem Asad		
Supervisor Name 1	Dr. Faiz Fauzy Mustafa	Field: Applied Mechanics		
Supervisor Name 2	M.Sc. Zaid R. Mohammad	Field: Applied Mechanics		

The Aim of the Project

The objective of this project is to design and manufacturing of a device to produce cylindrical tubes made from composite materials with different angles.

Project Summery

The project can be divided into three main parts as following:

- 1- Making all the design calculations according to the type and dimensions of the composite tubes.
- 2- Manufacturing the device using the available materials according to the design specifications.
- 3- Operating the device and starting with manufacturing the composite tubes with different length and angles.

Discussion

Composite tubes samples have been produced with good specifications which can be used in different applications. The production of such types of composite tubes is very important in manufacturing applications.

Any Suggestions for Future Developments

Modify the device by changing the manual control to automated control by computer to obtain higher quality in production with lower time and cost.

