Study of production system of Energypac Electronics Bangladesh Ltd.

A Project and Thesis submitted in partial fulfillment of the requirements for the Award of Degree of Bachelor of Science in Electrical andElectronic Engineering

By

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Certification

This is to certify that this project and internship titled **“Study of production system of Energypac Electronics Bangladesh Ltd**” is done by the following students under my direct supervision and this work has beencarried out by them in the laboratories of theDepartment of Electrical and ElectronicEngineering under the Faculty of Engineering of Daffodil International University in partialfulfillment of the requirements for the degree of Bachelor of Science in Electrical and ElectronicEngineering. The presentation of the work was held on 31 January 2021.

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The project and internship entitled **"Study of production system of Energypac Electronics Bangladesh Ltd"** submitted by **Md. Saiful Islam ID** #: 172-33- 503 , Session: Summer 2017 has been accepted as satisfactory in partial fulfillment of the requirements for the degree of **Bachelor of Science in Electrical and Electronic Engineering** on ---------- 2021.

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Department of EEE,

This Internship is dedicated to

my parents & teacher's

For their endless love,support and

encouragement…

Student's Declaration

I am Md. Saiful islam very much glad to inform that the Practicum Report on **"Study of production system of Energypac Electronics Bangladesh Ltd"** has only been prepared as a partial fulfillment of the Bachelor of Science in Electrical and Electronics Engineering (BSEEE) Program. It has not been prepared for any other purpose of reward or presentation. All data and information given here are verified by the organization and the report does not bear any false data. I believe this will fulfill all the requirements of my supervisor and examiners of this report.

Sincerely Yours

.....

Md.Saiful Islam

ID# 172-33-503

Program:EEE

ACKNOWLEDGEMENT

First of all, we give thanks to Allah or God. Then we would like to take this opportunity toexpress our appreciation and gratitude to our project and thesis supervisor Md. Sohel Rana, Lecturer of Department of EEE for being dedicated in supporting, motivating andguiding us through this project. This project can't be done without his useful advice andhelps. Also thank you very much for giving us opportunity to choose this project.Apart from that, we would like to thank our entire friends for sharing knowledge;informationand helping us in making this project a success. Also thanks for lending us some toolsandequipment. To our beloved family, we want to give them our deepest love and gratitude forbeing very supportive and also for their inspiration and encouragement during our studies in this University.

Thank you, ALLAH, for always being there for me.

Executive Summary

This internship report is an exclusive study of Industrial production process of ceiling fan of Energypac Electronics Limited (Factory). The main objective of this report is to get the practical experience through observing the creativeness of production process with various types of testing instrument and their test. Being attached with production maintenance engr. of EEL and deputy manager (factory), opportunity was created to roam around whole factory production places which gave an introduction to industrial based job requirements. To do analysis with practical work, some related theories are also discussed in this report. One of the most important terms which are briefly discussed in this report is Production system, performance and testing of ceiling fan working principle, explained in this report. Since the opportunity was given to take part in the training it became easy to describe the system of production process. All the information which is learnt from training and visiting site will be reflected through this report with proper analysis based on theory.

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Chapter 1

Introduction

1.1 Introduction

Nowadays we cannot think of a single day without electricity. All our daily needs refer directly or indirectly to electricity. All the Home Appliances use electricity at a great rate. For industrial levels the energy consumption is huge. Heavy machines use lots of electrical power everyday for production purpose of different products.

The electricity used over the lifetime of a single incandescent bulb costs 5 to 10 times the original purchase price of the bulb itself. Light Emitting Diode (LED) and panel light shave revolutionized energy-efficient lighting.

Wiring accessories like switch, socket, fuse etc are very much important for supply electricity. Ceiling fan is one of the most essential appliances. It is the application of single phase induction motor.

1.2 Origin of the Report

As a partial fulfillment of BSEEE program I have done this practicum report on "Study and observation on production process of electrical appliances of Energypac Electronics Limited." under the instruction of Engr. Md. Shabul Islam (Sr. manager Factory:Unit-3), EEL is a productive organization which produces varieties of electronics products such as ceiling fan .

All of us want to save money on our energy consumption. Efficient lighting choices can significantly cut home utility costs. Understanding CFL (Compact Fluorescent Light) and LED (Light Emitting Diode) bulbs will help us make wiser decisions for the environment and our pocket.

1.3 Objectives

To know how to produce Ceiling fan.

To observe about production process.

To understand about their testing procedure.

To see packaging.

1.3.1 Board Objectives

The main objectives are to extrovert my theoretical knowledge to the practical field with adequate conceptualization and understanding production process and the performance of the parameters in Ceiling fan .

1.3.1 Specific Objectives

The particular objectives of internship are as follows:

To get an overview of industrial production process.

To have clear concept idea about industrial manufacture process.

To apply theoretical knowledge in the practical field.

Study on Energypac Ceiling fan.

Finding out the different types of problems which a rise in various ceiling fan.

Finding out the efficiency of Ceiling fan.

To know about testing process of ceiling fan .

Energy consumption analysis between Energypac ceiling fan VS competitor ceiling fan

Suggest probable solution of the identified problem.

To understand the official system of the company.

1.4 Methodology

Methodology describes the manner in which data is collected, analyzed and interpreted. To prepare this report primary and secondary data has been used. The sources are mentioned below:

1.4.1 Primary Data Sources

In this report, the primary data is the raw data which has been collected based on practical experiment accomplished of the company. I collected notes, lectures, sketches, diagrams, templates found in EEL. Also take the information from EEL Engineers.

1.4.2 Secondary Data Sources

Secondary data includes reviewing articles and internet for the completion of the organizational part. To give the report a better look, secondary data is also collected from different websites, books, newspapers and consultation and some interview sessions.

Chapter 2

Organization Overview

2.1 Company Name

“Energypac Electronics Limited”

2.2 Corporate Overview

Energypac’s eyes excellence in business to achieve techno-autarky of Bangladesh. Astoundingly, through relentless endeavor over the last two-plus decades, Energypac is now deemed as a top power engineering business dome. Besides its routine biz, it hunts indigenous talents across the country and inducts them aboard its teams. Products have been diversified for the clients’ total power solutions including power generation,

transmission, distribution, protection and control. Energypac is now spanning the globe across the borders. The Company is committed to provide world standard products and services in design, manufacturing, testing, etched the global export market. We are keen on flawlessness and fineness. We are bent upon inseparable cooperation with the clientele in every phase e.g. investment making decisions feasibility study, materials and equipments selection, machineries procurement timely supply, installation and commissioning of equipments and permanent after-sales service. Our huge stock-lot of spares suffices to feed the customers’ immediate need. Not just the biz, Energypac trust is cemented on a perennial relationship with the customers on mutual benefiter products are conducive to life and environmental dream of the power-autarky for Bangladesh, which will bloom into a home of peace and prosperity. Since 1982, Energypac is incorporating the best men & machines in the business with a blend of latest technological innovation & state of the art production facilities [1].

2.3 Company Overview

Energypac Electronics Limited was established in 2005, a concern of the Energypac family, aiming to provide complete electronic solution. It holds one of the most modern and pioneering electronics industry in Bangladesh. It includes sophisticated manufacturing equipments along with the research and development facilities to ensure the quality of the products in every stage of manufacturing, trading with some world renowned Electronic brands like Elegant (Wiring accessories & protection device) Sassing (protection device), Lighting Solutions, Water Pump etc.

This company has created revaluation in the power sector of Bangladesh by introducing Compact Fluorescent Lamp generally known as Energy Saving Lamp (ESL) which save 80% energy and thus conserve energy for other purposes than illuminating. Energypac ESL was rigorously tested in the laboratory of BUET and has been certified as a true lamp for saving energy in required illumination. The organization have devoted in research,

development and production of highly efficient, environment-friendly products for the customers. These products not only meet internationally certified standards but also save energy in order to benefit the world. For the past years, Energypac continuously presented energy-efficient products to our clients. We believe, these continuous efforts would not only benefit Energypac, as well as would increase the living standard worldwide, helping us to "Go Green".

Energypac is committed to being a well reputed, customer-oriented, leading professional manufacturer. We have strictly maintained international standard in the entire system – from design generation to production process; from quality control to customer service. The modern lamp production facilities were awarded the prestigious ISO 9001: 2008 Certification by Geneva Switzerland based accredited certification body and the prestigious UKAS Certification by United Kingdom based accredited certification body for its state-of-the-art quality system. The product marketing approvals include Bangladesh Standard and Testing Institute – BSTI, CE, Bureau VERITAS, and UKAS.

The company provides quality products and services backed up by long standing Total Quality Management culture and excellent business operation system. The organization is intend to set and maintain a very high level of product quality and service – a benchmark for the industry – using Total Quality Management approach to provide the best qualities possible in competitive cost and further enhance the reputation of being industry leader [1].

"…we lead and let others follow…."

Figure 1.1: EEL Factory

2.4 Logo

Energypac

Energypac Electronics Ltd

2.5 Location and Area

The factory situated on the Dhaka-Mymenshing highway on 64800 square foot or 1.4876 acre land at Monipur, Hotapara Industrial area- 40 km north of the capital city Of Bangladesh.

2.6 Mission

The missions of Energypac Electronics Ltd. as follow-

Create awareness for importance of energy conservation among the people of Bangladesh.

Foster technological innovation and excellence in the field of electronics with continued emphasis on sustainability.

Provide customers with increased variety of high quality energy efficient and renewable energy solutions.

2.7 Vision

The vision of Energypac Electronics Ltd. as follow-

Energypac Electronics Ltd. has a vision to successfully commercialize the concept of sustainable energy in Bangladesh and become the nation’s leading Green Solution provider.

2.8 Quality Policy

Energypac Electronics is committed to enhancing ‘Customer Satisfaction’ by providing best in class end to end engineering solutions. We will achieve this by adopting the following ‘Quality Culture’ as the basic principles of our achievement:

Plan-Do-Check-Act (PDCA) Methodology.

Monitoring level of our ‘Customer Satisfaction’.

SMART ‘Quality Objectives’.

Complying with Quality Management System- ‘ISO 9001:2015’ International standard.

‘Continual Improvement’ by effective use of ‘Internal Quality Audits’, ‘Corrective and Preventive Action Measure ’and ‘Management Reviews’.

2.9 Products

Unit 3: Ceiling Fan [1]**.**

2.10 Showrooms and Sales Centre

Energypac Electronics ltd. has lots of sales center all over the country. The largest showroom and sales center are:

Dhaka

Gazipur

Mymenshing

Narayanganj

Comilla

Chittagong

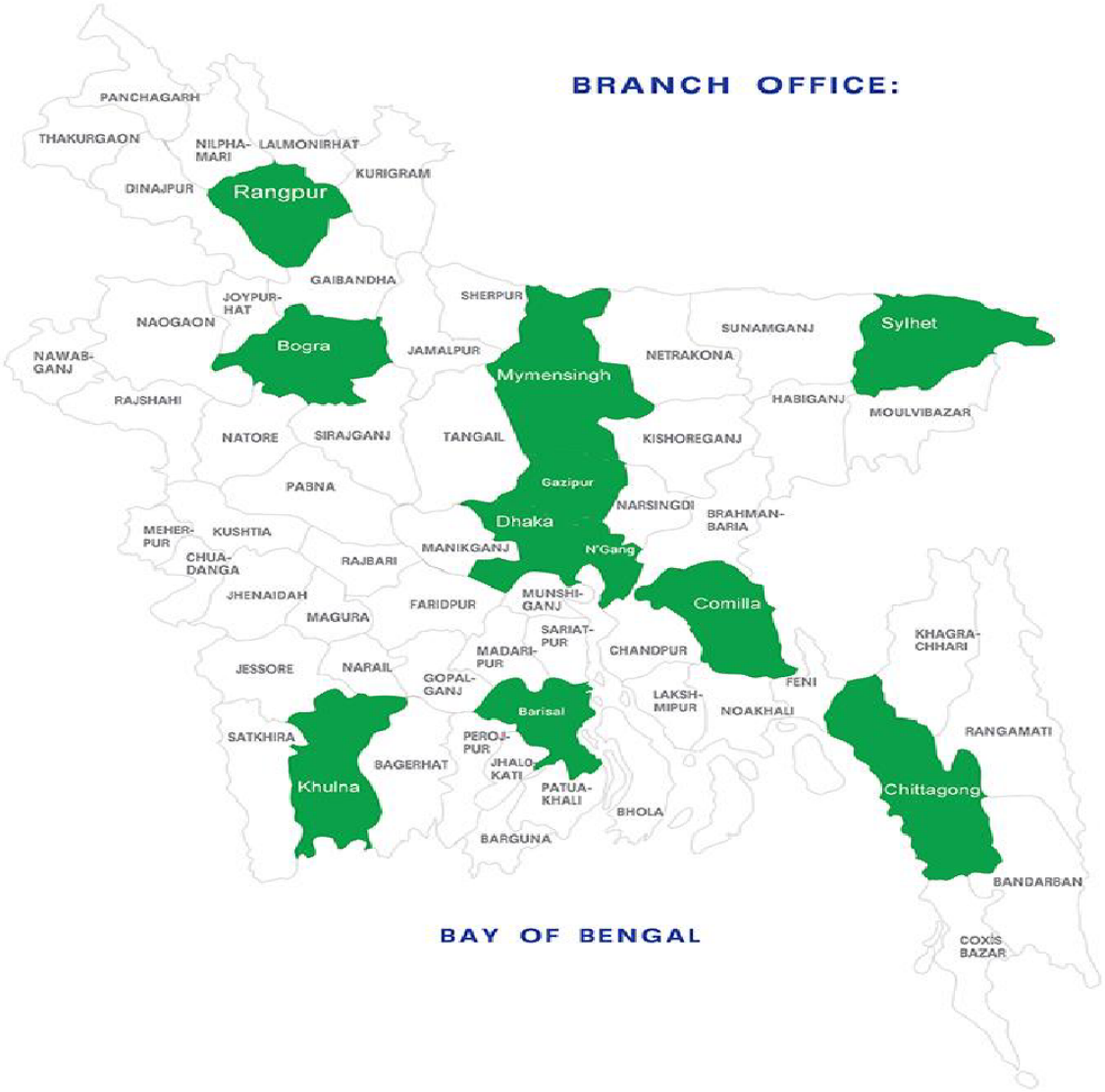
Barisal

Khulna

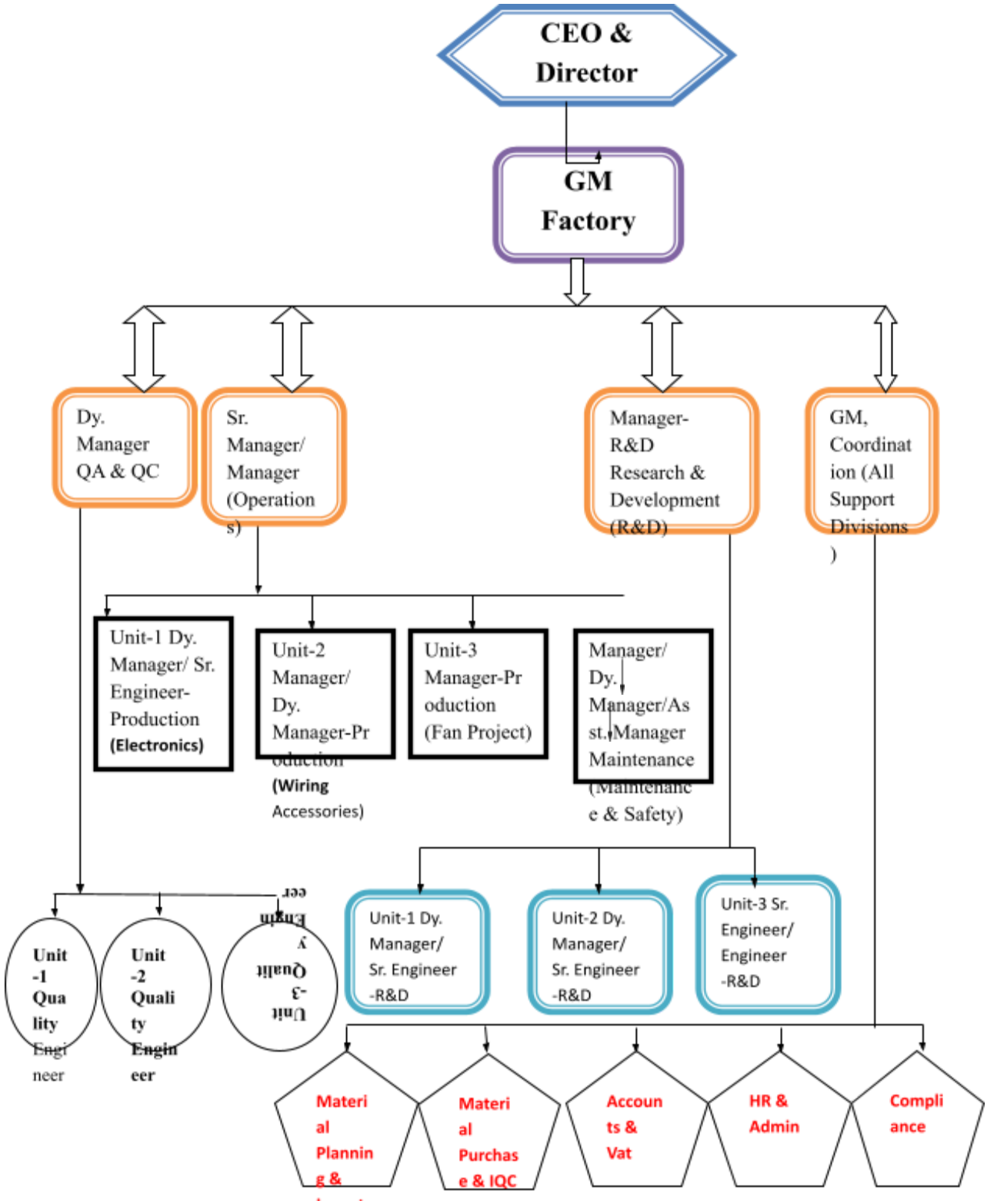
Rangpur

Bogra

Sylhet



2.11 Organogram of EEL



Chapter- 3

3.1 Ceiling Fan

Figure 3.1: Energypac ceiling Fan

A ceiling fan is a mechanical fan, usually electrically powered, suspended from the ceiling of a room, that used hub-mounted rotating paddles to circulate air.

3.2 Working Principle of Ceiling Fan

The conventional ceiling fans operate directly through single phase induction motors. Low fan speeds are achieved with motor wire windings of around 18, 20 or 22 poles, resulting in low operation speeds. To get a much wider control on speed the rotor resistance has to be higher through stator voltage control operation. Typically ceiling fans in most spaces utilize the efficiency of single phase induction motors. Because of minimum power consumption these motors are also known as fractional kilowatt motors.

Single phase induction motor – Single phase induction motors (capacitor start, also known as split phase induction motor) are required in ceiling fans due to their easy handling and repair, simple design, cost and efficiency. Single phase motor is the economical choice for office and house spaces as power output of loaded supplies are small.

Ceiling fans typically work on induction motors that covert electric energy into mechanical energy. The capacitor of ceiling fans torques up electric motor that lets it run just after a start. The current reaches motor and makes its path towards coil that is wrapped around metal base. While the current conducts through the wire, a magnetic field gets created that exerts force in a clockwise motion that converts electric energy into mechanical energy. With this action the motor coil begins to rotate. When these coils are spinning the fan captures the motion while transferring to fan blades [10].

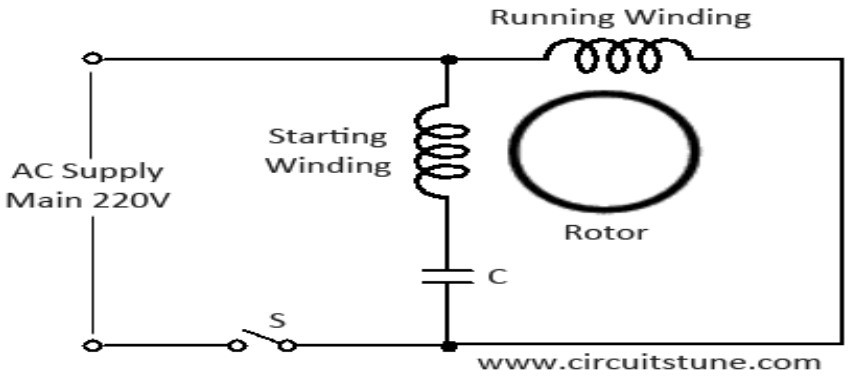


Figure 3.2: Diagram of Ceiling Fan

Product name: Energypac ceiling fan

3.3 Product Introduction

Sl. No	Material	Material Description
1	1400000003	56" CEILING FAN CR WHITE GB & SC DELUXE
2	1400000004	56"CEILING FAN CR WHITE COLOR WITH GB
3	1400000005	56" CEILING FAN CR WHITE COLOR GB & SC
4	1400000006	56" CEILING FAN DT WHITE COLOR WITH GB
5	1400000007	56" CEILING FAN DT WHITE COLOR GB & SC
6	1400000008	56" CEILING FAN DT WHITE WITHOUT GB & SC
7	1400000009	56" CEILING FAN MR COLOR WITH GB & SC
8	1400000010	56" CEILING FAN MR COLOR WITH GB
9	1400000011	56" CEILING FAN NTG COLOR WITH GB & SC
10	1400000012	56" CEILING FAN NTG COLOR WITH GB

Ceiling Fan Color

Energypac

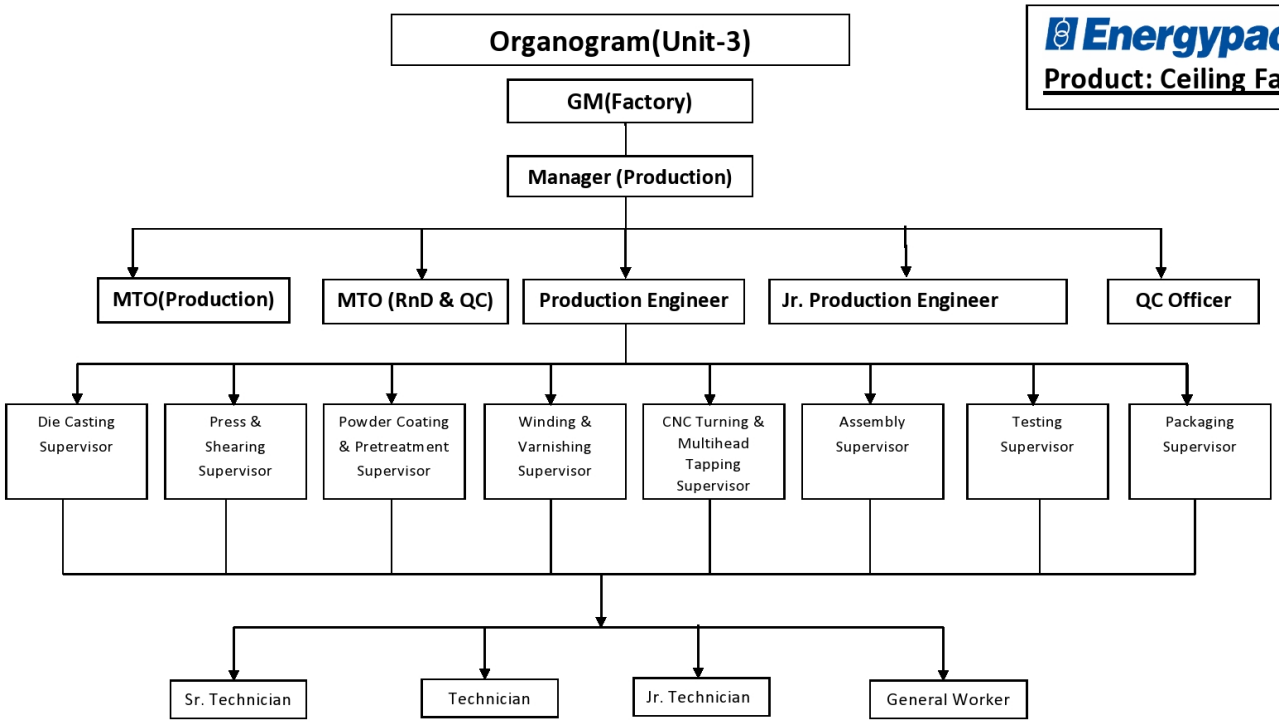
Picture 1.1: DT White

Picture 1.1: Crescent White

Picture 1.1: Maroon

Picture 1.1: NT Green

3.4 Organogram of ceiling fan section :



3.5 List of All Machines:

1. High Speed Press Machine
2. Die Casting Machine(3)
3. Mechanical Press Machine(4)
4. Shearing Machine
5. Bending Machine
6. Winding Machine(4)
7. Insertion Machine(4)
8. Turning Machine(3)
9. Multihead Tapping Machine
10. Varnishing Unit
11. Pre treatment Plant
12. Powder Coating Plant
13. Cylindrical Grinding Machine(2)
14. Shaft Pressing Machine
15. Fan Top Cover bearing fixing Machine
16. Fan Bottom Cover bearing fixing Machine
17. Fan Body fitting Machine
18. Blade Riveting Machine

19. Trimming Machine
20. Hydraulic Press Machine
21. Angle Checking Machine
22. Automatic Sequential Analyzer
23. Automatic Ceiling Fan Testing Machine
24. Polishing Machine
25. Assembly Unit
26. Surface Grinding Machine

3.6 Raw material list of ceiling fan

1	Aluminum Ingot (ADC/12)
2	Aluminum Sheet
3	Auto color / Laquer
4	Adhesive Tape
5	Bearing Washer - Top
6	Bearing Washer - Bottom
7	Ball Bearing - Top
8	Ball Bearing – Bottom
9	Blade Box 1x1
10	Blade Flapper (Shank paper) - 12"x4"
11	Blade Fixing screw
12	Blade damping Washer
13	Bronze Powder (Golden color)
14	Capacitor
15	Cotter pin
16	Canopy Screw
17	Clear Varnish
18	Canopy
19	Capacitor clamp fixing screw
20	Cable Tie
21	Down Rod
22	E.C.Grade Aluminum Ingot
23	Fibre Glass Sleeve - Ø 1.5 mm *
24	Fibre Glass Sleeve - Ø 4.0 mm(ID) *
25	Fibre Glass. Sleeve - Ø 5.0 mm(ID) *
26	Grease
27	GARDOCLEAN-619
28	GARDACID 201 M

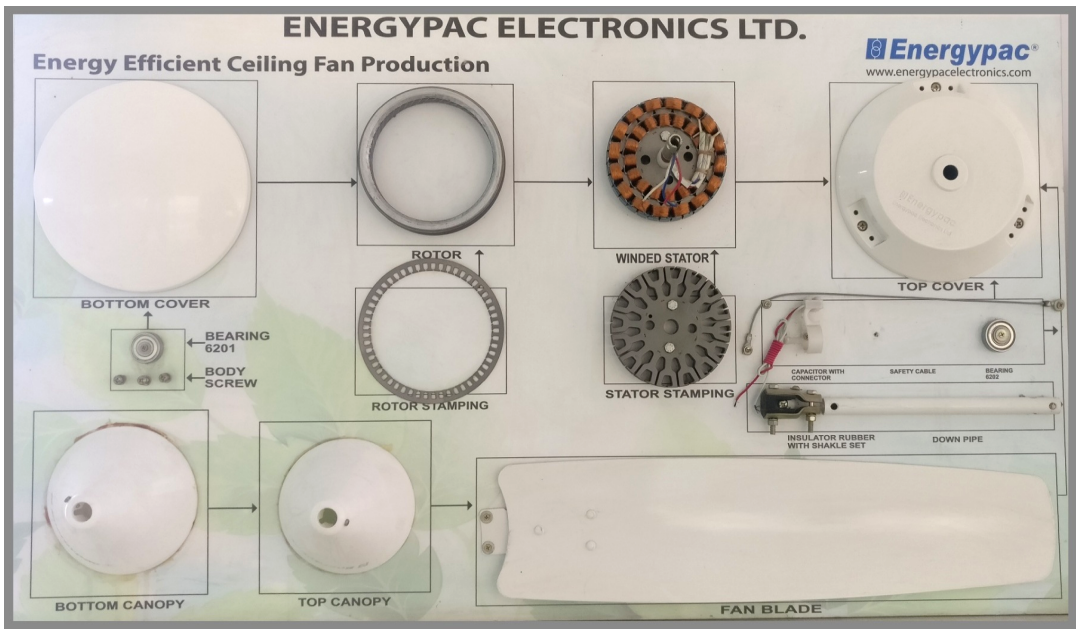
29	GARDACID-206 AA
30	GARDACID-219
31	GARDOBOND - C
32	GARDOBOND 711
33	GARDOLENE-26M
34	GARDOLENE 86
35	GARDOBOND - Additve - C . C
36	Hex.Bolt 3 8mm
37	Hex. Nut 6 mm
38	Hex.Bolt 48 mm
39	Insulated wire (single cable)
40	Insulated wire (T/T)
41	Capacitor clamp with insert
42	Ms Sheet (Mat sheet)
43	Motor Box 1x1
44	Nylon spacer for shaft
45	Nc Thinner
46	Name Plate“
47	Polyester paper
48	Polyester paper
49	Polyester paper
50	Preloading Spring
51	Presspan Paper in Top cover
52	Rapping Paper (China Oil Paper)
53	Regulator
54	Polish (Car Polish)
55	Powder coating Paint
56	Plain washer
57	Insulator Rubber for Down Rod
58	Rubber band
59	Silicon Sheet
60	Shaft
61	Shakle
62	Silica Gel (0.002gm)
63	Spring washer

64	Safety screw
65	Spring Washer
66	Shank & Blade fixing Rivet (Alu)
67	Safty Cable
68	Sticker
69	Super Enamel
70	Super Enamel
71	Thinner /Octane
72	Top & Botom Fitting screw
73	Varnish
74	Warranty Card

3.7 Production Process of Ceiling Fan

All machines operation description of fan section (Unit-3) of Energypac Electronics

3.7.1 Major Parts of Ceiling Fan



3.7.2 Main raw material of ceiling fan :

Sl. No	Item Name
1	Aluminum Ingot (ADC 12)
2	Aluminum Ingot (EC Grade)
3	Silicon Sheet
4	Aluminum Sheet
5	MS Sheet
6	ZZ Ball Bearing – 6201
7	ZZ Ball Bearing – 6202
8	SH Capacitor – 2.50 µF
9	Powder Coating Paint
10	Super Enamel Copper Wire
11	Canopy
12	Down Pipe
13	Shaft
14	Safety String

3.7.3 High speed press machine:

By using this machine we can make rotor and stator. Rotor and Stator made by silicon sheets. Silicon sheets are imported from outside. Silicon is a raw material. 34 sheets combined to make a stator and 33 sheets combined to make a rotor. In this machine both rotor and stator are made. From one side of this machine input the silicon sheets and by processing this sheet rotor and stator are made. In two ways rotor and stator gets out. This is the main work of this machine by creating rotor and stator part of fan.

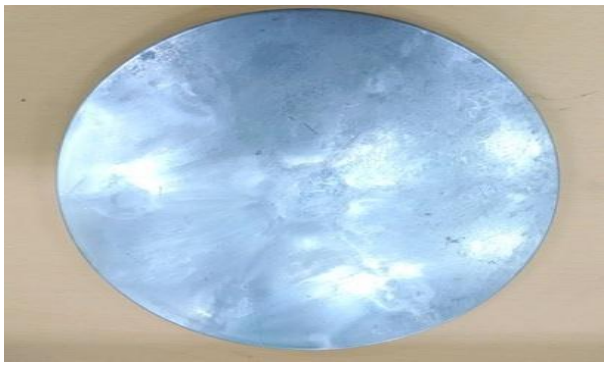
3.7.4 Die Casting Machine: There is a three part of this machine. One part is using for making the top part of the fan. Another part is using for creating the bottom part of fan and last part rotor part of fan. Now I am shortly describing about this machines:

Figure 5.2: Die casting machine "©Daffodil International University

3.7.1 (a) Die casting machine (Top Cover part):

By using this machine top part is created. Creating this part first of all we need aluminum which is another raw material imported from outside. Lots of Aluminum bars are imported from outside for creating the top and bottom cover part of fan. First of all these aluminum bars are heated on the heat chamber and getting melted. Temperature on the heat chamber is 690^{8}c to 720^{8}c. When aluminum bars getting melted then it will process on the machine and creates the top cover of fan.

3.7.4 (b) **Die casting machine (bottom cover part):**



There is a same process for creating the top cover and bottom cover part of fan. There is a slight difference in the module of bottom part of die casting machine but the process is same as creating the top cover part of die casting machine.

3.7.4 (c) **Die casting machine (rotor part):**

After creating the rotor part from the high speed press machine then the rotor take into another machine to prepare the actual rotor part of the fan. The rotor part is consisting of 33 silicon sheets. After that rotor part insert into the die casting machine and fill up the rotor part with aluminum. There is an angle between rotor part and the angle is 22-24°. There is a cause why we give this angle in the rotor. The main reason is if we don't give this angle then the aluminum will not get into this rotor part in a proper way. That's why we give this angle to perfectly shape the rotor part with aluminum.

3.7.5 Hydraulic Press Machine: After created the stator from the high speed press machine then the stator is needed to compress. By using this machine stator can be compressed. Stator needs compressing because there are 34 individual sheets which are combining to create a stator. Compressing it will help not unbind the sheets.

3.7.6 Trimming Machine: Top cover and bottom cover are created on the die casting machine. When we get the top cover and bottom cover from this machine, those covers are not in actual shape we got. There is some extra aluminum with those covers. By using this machine trimming both top cover and bottom cover into the main shape eliminate the extra shape of aluminum.

3.7.7 Polish machine: After creating the top cover and the bottom cover of fan there should be polishing both top and bottom cover to remove the fractions in both covers. There is a "

polishing drill set up on the front of this machine. By using this drill both top and bottom covers get polished. Removing the fractions or any scratch on both covers is the main work of this machine.

3.7.8 Shearing machine: This machine is used for cutting the aluminum sheets which is also imported from outside. This aluminum sheets are used in making the fan's wings. There is large aluminum sheet inputted on the machine and by measuring fan's wings size will cut the aluminum sheets into wings sizes. This machine is used for cutting this aluminum sheets to create the fan's wings.

3.7.9 Mechanical press machine (sheet part):

After finishing the aluminum sheets cutting, then these aluminum sheets are given to the mechanical press machine to cut into the perfect shape of fan's wings. Firstly aluminum sheets are set on the machines pressing portion and after mechanical press these sheet cut into the perfect shape of fan's wings. This is the main principle of this machine

Chapter 4

4. Process of production

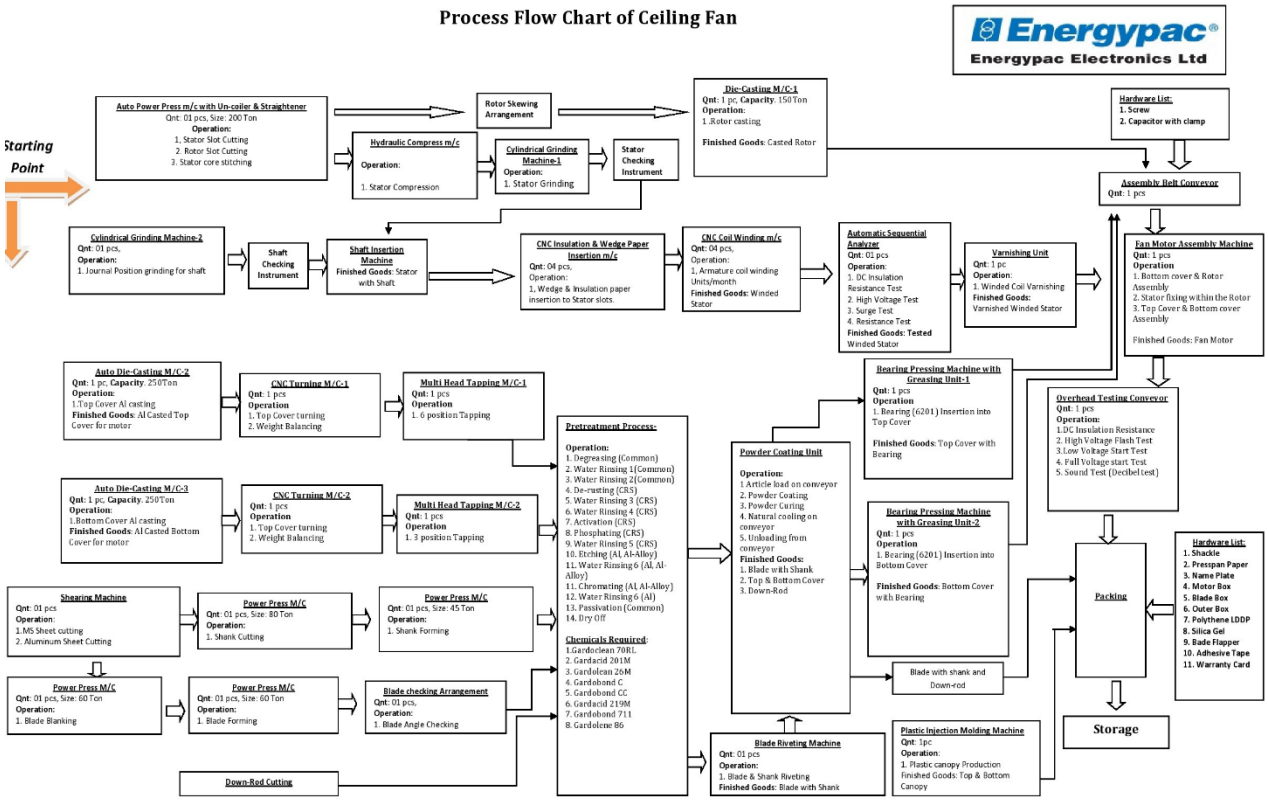


Fig : process flow diagram of Energypac ceiling fan

4.1 Top and Bottom cover manufacturing

Die casting machine: Made in Taiwan by Evergreat. Raw material is ADC 12 Aluminum ingot. Mould of this machine is cleaned by die coat and water so that damage is decrease. Damage part is farther used as raw material.

4.2 Trimming: Rest part of top and bottom cover is cutting here.

4.3 CNC Turning Machine:

Made in India. Max. I/P voltage is 415V/3 phase, Max. current is 35A, Max. Power is 25 KVA, Earth voltage is 1.0 V. Phase cutting, Rotor house cutting, Bearing house cutting is finished here. Rotor house inner dia is checked by venire caliper, Bearing house is checked by Air gauge, Weight is checked by Digital weight scale.

4.5 Multithread Tapping:

Screw thread is cutting here. 6mm drill is used.

4.6 Polishing: Polis is finished by file and emery paper so that smoothly fix top and bottom cover.

4.7 Pre-treatment plant (Chemical wash):

Figure 5.3: Chemical plant

This plant is used as chemical treatment.

Degrading-- GARDOCLEAN-619 is used. Duration: 10 to 15 min.

Water Rinse-1- “©Daffodil International University

Eachant—GARDACID-219 is used. Duration: 4 to 5 min.

Water Rinse-2—For 1 to 2 min

Chromating – GARDOBOND-711 is used. Duration: 4 to 5 min.

Water Rinse-3 –- For 1 tom 2 min

Finally it is dried in heat chamber by 120˚C -130˚C temperature

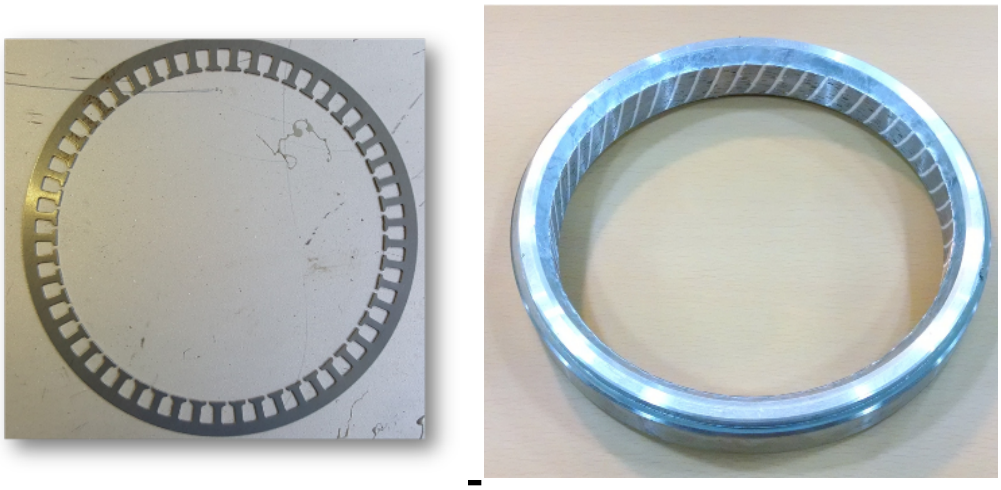
Paint—Manually painted then dry in heat chamber by 190˚C.

4.8 Painting section:

Fan top cover , bottom cover , blade & down pipe paint into powder coated paint . There are four color of powder coated paint.

1. EP glossy powder for crescent white color
2. EP glossy powder for DT white color
3. EP glossy powder for marron color
4. EP glossy powder for NT green “

4.9 Rotor manufacturing process



High Speed Machine—By this machine rotor stamping plate is produced. Raw material is silicon Sheet. Thickness of this sheet is 0.5 mm.

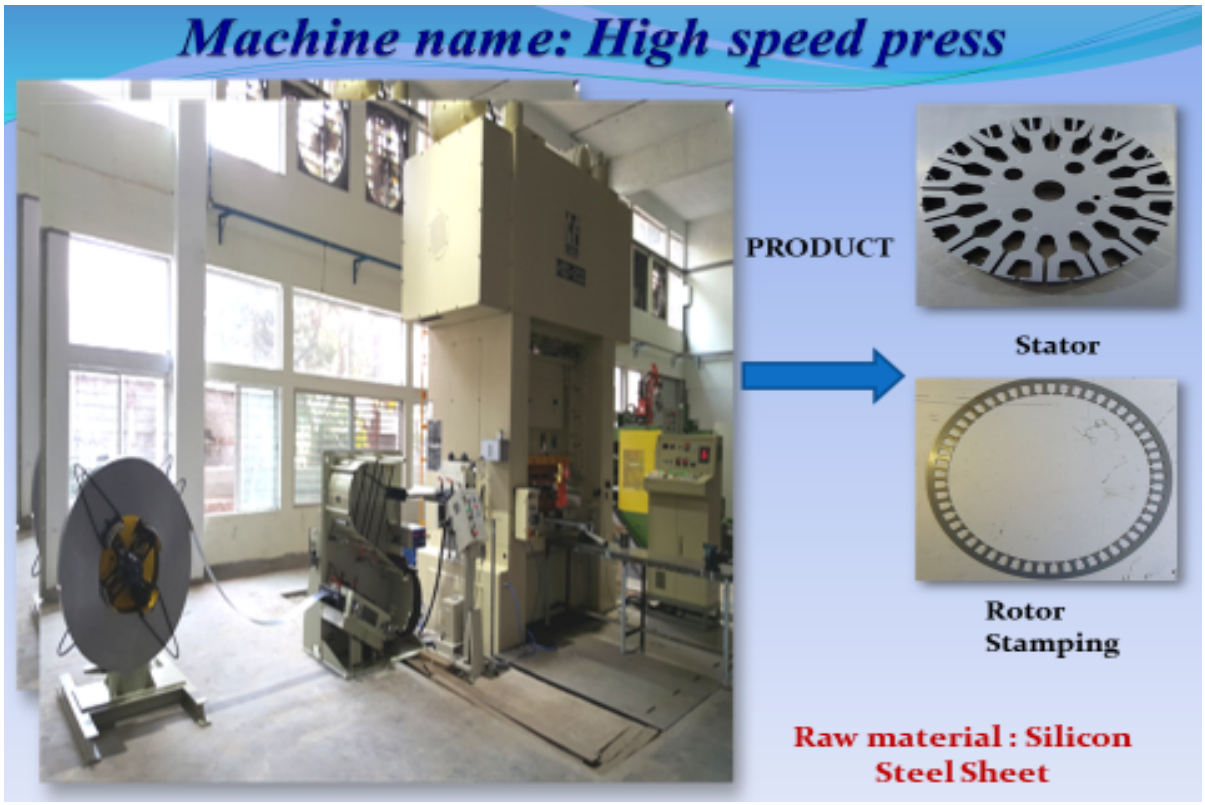


Figure 5.4: High speed machine“

Die casting--- By this rotor is produced. Raw material is Aluminum ingot (EC Grade) and rotor stamping plate.

4.10 Hydraulic Press Machine: Rotor is placed here.

Fig : Hydraulic press machine

CNC Turning Machine


Inner dia and outer dia of rotor is cutting here. I/D, O/D is checked by venire caliper, Rotor height is checked by master gauge, rotor angle is checked by skew angle

4.11 Stator manufacturing process

High speed machine—

Stator is produced here. Raw material is silicon sheet. Thickness of this sheet is 0.5mm.

Hydraulic Press Machine: Stator is placed.

4.12 winding

It is done by CNC winding machine. Inner side is starting coil and in every slot turns are 330. Raw material is Super enamel H-class SWG-34. Then insert fibre in slot to protect from short with body and wire. Outer side is running coil and in every slot turns are 425. Raw material is Super enamel H-class SWG-35. Then insert ampere tube over the wire.

4.13 Armature Checking without Shaft:

Figure 5.5: Automatic Sequential Analyzer Machine

It is checked by Automatic Sequential Analyzer Machine. Resistance range is for main coil 260Ω to 303.6 Ω and for auxiliary coil 157Ω to 208Ω. IR limit is 10 MΩ in 500 V DC. HV—Test voltage is 2000V and leakage current is 1 mA.

On Finding: Resistance—main-280.70Ω, Aux-168Ω. IR is 8.32MΩ and HV is in 1934V 0.893mA.

4.14 Varnishing plant :

Insulating burnish 1 L and octane 2 L mixture is given to armature and heat it in heat chamber.

4.15 Shaft press machine: Insert shaft with armature. Shaft temper is checked by C-Jet air gauge.

4.16 Grinding:

By cylindrical grinding machine armature is grinded so that armature is freely rotate with rotor.“

4.17 Blade Manufacturing Process

To sheets are used for making ceiling fan blade.(aluminum and MS)

4.17.1 Sharing Machine: Aluminum sheet is cutting here. At first 152mm then 600mm. Thickness of this sheet is 1.1mm. MS is cutting by 54mm then shank is 123mm.

4.17.2 Mechanical Press Machine:

By 60 ton machine blanking the aluminum sheet. Length is 596mm and with top is 135mm middle is 146mm and bottom is 110mm.By 60 ton aluminum sheet is banding. By 80 ton machine blanking the MS then by 45 ton banding.

4.17.3 Rebating Section: By rebeat and blade damping washer aluminum blade and shank is joined.

4.17.4 Chemical Wash:

Same as aluminum accept Derusting (GARDACID-201M+ GARDACID 206AA) (Duration 5 to 15 min) Surface activation (GARDOLEAN-26M) (Duration 30 to 45 Sec).

4.18 Down Pipe

Chemical wash and paint (Same as MS).Length is 10inch, thickness is 1.6 mm, I/D is 14mm and O/D is 15.5mm.

4.19.1 Assembly process of Fan:

Rotor and Stator is polished by emery paper and colored by auto color and thinner to protect form moisture.

Stator check

In the middle of top and bottom cover bearing fixing by numeric ball press. Top bearing is model-6202 and bottom bearing model is 6201.

4.19.2 Rotor pushing in bottom cover.

Air gap check. 0.25mm air gap in between stator and rotor.

Armature push in bottom cover with preloading spring and nylon washer.

4.19.3 Top cover adjusting with bottom cover.

Screw fixing with body. 13mm screw 3 Pcs and 6mm spring washer.

Connect capacitor with fan with capacitor guide. 2.25µF capacitor with plain washer and safety cover.

4.19.4 NO load test with conveyor belt (bearing noise, friction, RPM, Watt, voltage test , polarity).


Automatic running analyzer
AUTOMATIC
RUNNING
ANALYZER
110
222
0.00
9005AJ
WATT
AUTOMATIC RUNNING ANALIZER


Automatic ceiling fan analyzer
AUTOMATIC
CEALING FAN
ANALYZER
1 .
0.00
0.01
9005AJ
AUTOMATIC CEILING FAN ANALIZER

No load test , when testing process fulfill standard parameter when the fan is QC passed.

Fixing screw and bold and safety pin insert with shaft.

Insert 6 pcs blade screw with 3 pcs presspin paper with 6 pcs washer.

Cleaning

Body sticker insert in fan body

- **Size: 1400 mm/56 inch**
- **RPM: 320**
- **Frequency: 50Hz**

- **Voltage: 220 V**
- **A.D: 240m^3/min**
- **Watt: 65W**
- **P.f: 0.95**
- **Service value: 3.69 m^3/min/watt**

Warranty Sticker insert in body.

Raping with paper and set warranty card.

Packing: Insert into packet with silica gel , safety sting, down pipe, 2pcs canopy top and bottom with energypac logo, 2 hole sackle, 3 hole sackle, insulator rubber, fixing nut bolt.

Chapter -5

5.1 QC working area:

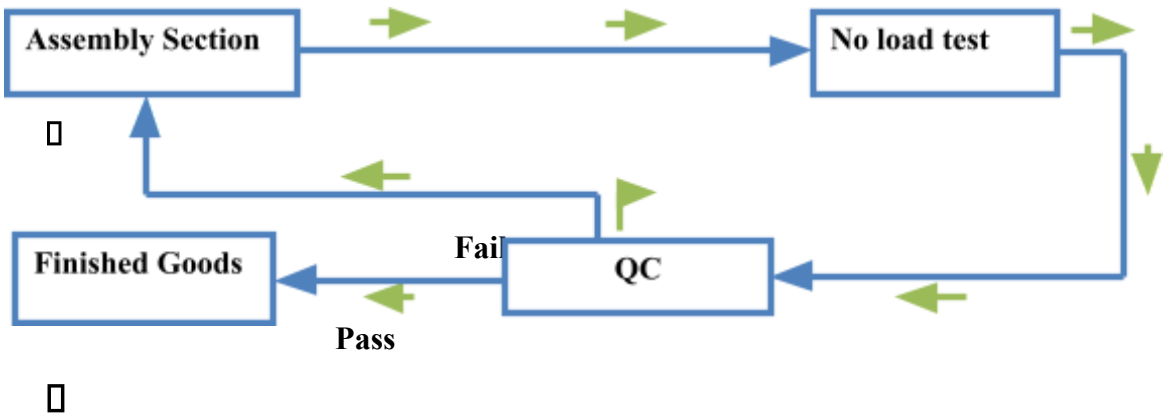
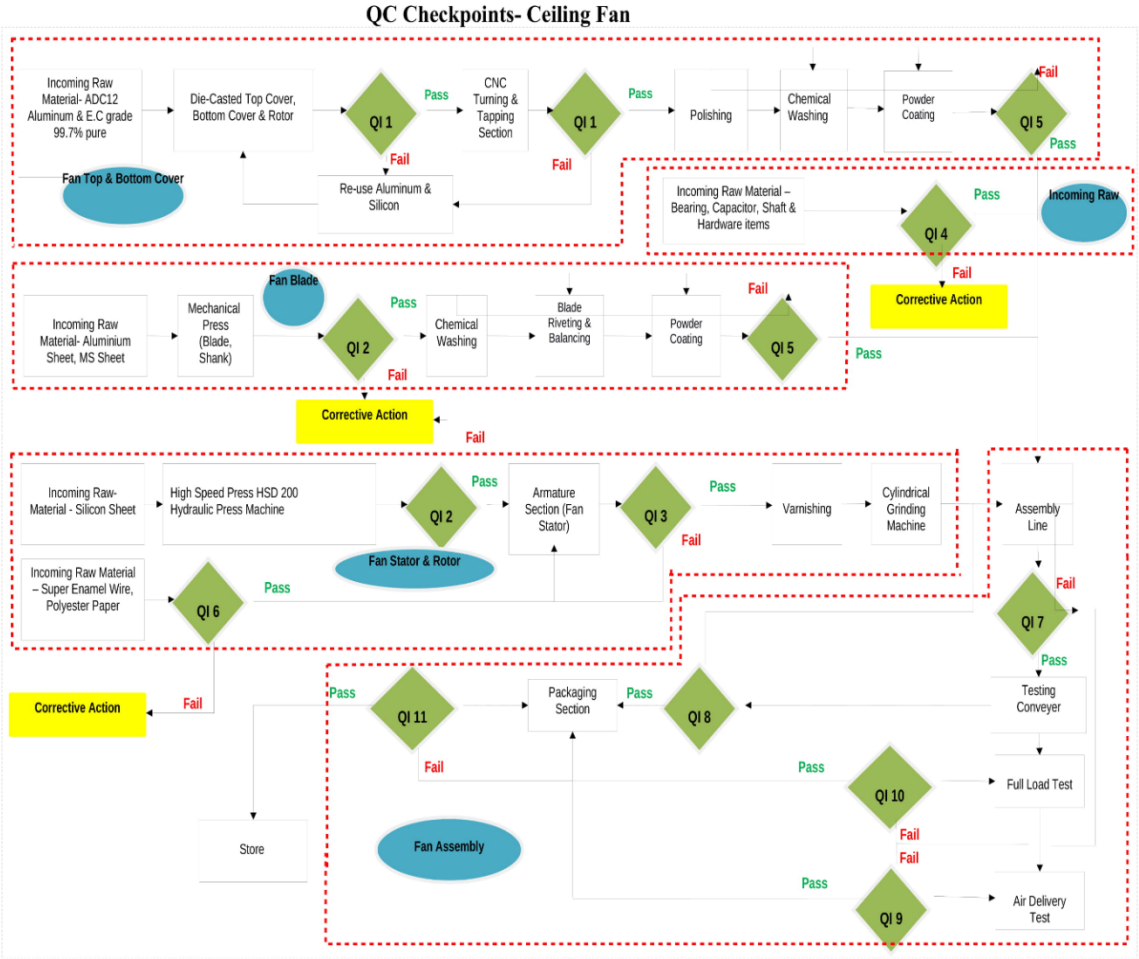


Figure 5.6: QC working area

5.2 QC check point :



5.3 Highly Testing Equipped R&D and QC Lab:

1 . Digital Vernier scale.

2. Digital Micrometer

3. Digital Volt meter

4. Digital watt meter

5. Digital Amp. Meter

6. Digital Power factor meter

7. Digital Tachometer

8. Digital Frequency meter

9. Digital Infrared thermometer

10.Automatic Air delivery chamber

11. Filler gauge

12.Digital weight scale

13.Rotor Bore (I.D) gauge

14.Rotor Bore dial comparator

15.Master ring for above

16.Rotor height snap gauge

17.Rotor height and flatness dial meter Rotor

18.Rotor OD caliper gauge

19. Rotor Master ring for above.

21. Rotor skew angle checking gauge.

22. Stator OD caliper gauge.

23. Dial comparator for OD / ovality.

24. Angle protector for blade.

25. Toggle clamp blade holding and tip height checking.

26. Blade camber gauge.

27. Depth gauge top cover Rotor sitting / Bearing. face and bearing. depth.

28. Depth gauge Bottom cover Rotor sitting / Bearing. face and bearing. depth.

29. Balancing mandrel for cover.

30. Rotary table – ovality & wobbling for cover.

31. Reamer for removing paints & putty and sizing of bearing housing of cover.

32. Automatic Sequential Analyzer & on line Ceiling Fan Tester(Armature test)

33. Automatic Sequential Analyzer & on line Ceiling Fan Tester(Fan body test)

34. HV Pin Hole tester.

35. Cut through tester. “©Daffodil International University

36. Springiness tester

37 . Elongation tester.

38. 2.2 KV / 11 KV B.D.V tester

39. OD dial comparator.

5.4 Air delivery chamber of ceiling fan :

Some snap shots

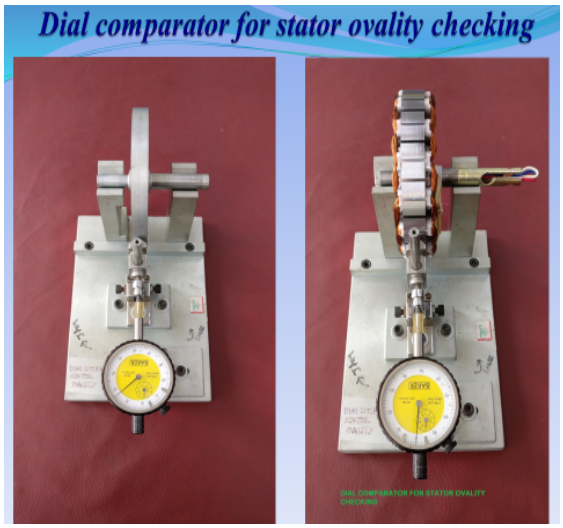
Testing Equipment of R&D and QC Lab

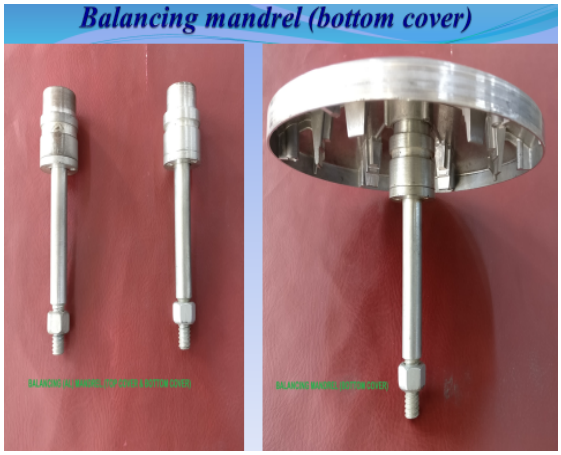
Anemometer

Digital techometer

“©Daffodil International University


Dial comparator for rotor height checking


Dial comparator for stator ovality checking




Toggle clamp for blade holding


Digital power meter
PF9811 智能电量测量仪/DIGITAL POWER METER
POWER METER

5.6 Quality Control Procedure

“

Chapter -6

6.1 Technical Specification

Table no 5: Technical Specification

Brand	Energypac
Size	1400mm
R.V	220 V
Rated Speed	320
Air Delivery	240 m^3/min
Frequency	50Hz
Wattage	65W
P.F	0.95
Insulation type	Class E
Service Value	3.69 m^3/min/watt
Number of blade	3
BDS No.	818

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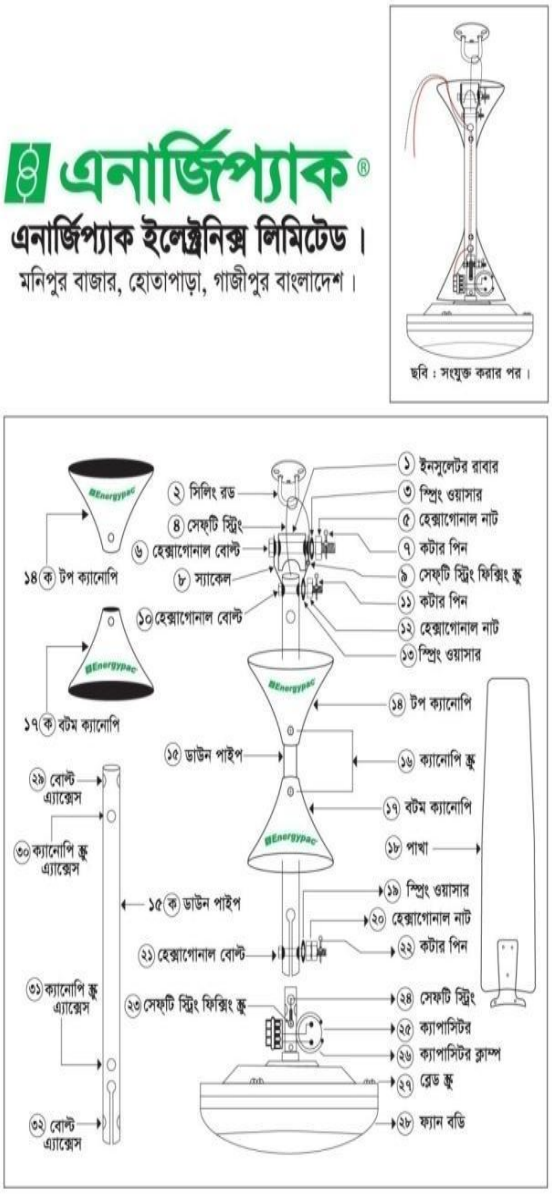
6.2 Fan Fixing System:



অতিরিক্ত নিরাপত্তা

ফ্যান ঝুলানোর পদ্ধতি

১) প্রথমে ফ্যানের মটর (বডি) টি কাগজ বা নরম কাপড়ের উপর রাখুন।

২) নাট-বোল্ট দিয়ে রাবার ইনসুলেটরের দুই পাশে ক্লাম্প (স্যাকেল) লাগান। এখানে একটি বোল্ট, একটি নাট, একটি স্প্রিং ওয়াসার এবং একটি কটার পিন ব্যবহার করুন।

৩) এবার ইনসুলেটর রাবার সহ ক্লাম্পটি (স্যাকেল) হ্যাঙ্গারের সাথে ঝুলিয়ে দিন।

৪) নাট-বোল্ট ও ওয়াসারের সাহায্যে ডাউন পাইপের কাটা প্রান্তটি ফ্যান বডির সাথে সংযুক্ত করুন। এক্ষেত্রে ১টি বোল্ট, ১টি স্প্রিং ওয়াসার এবং ২টি নাট ও ১টি কটার পিন ব্যবহার করুন।

৫) ডাউন পাইপের কাটা প্রান্তের বিপরীত পাশে সেফটি স্ট্রিং-এর এক মাথা সংযুক্ত করুন। এক্ষেত্রে ১টি ফ্ল্যাট ওয়াসার এবং ১টি ক্লু ব্যবহার করুন।

৬) এবার ডাউন পাইপের উপরের প্রান্ত দিয়ে ক্যানোপি প্রবেশ করান।

৭) ফ্যান বডির সাথে সংযুক্ত কেবল দু'টি ডাউন পাইপের নীচের অংশের ছিদ্র দিয়ে প্রবেশ করান এবং সোজা উপরের অংশের ছিদ্র দিয়ে বের করুন।

৮) ফ্যান বডির সাথে পাখা সংযুক্ত করুন (এক্ষেত্রে ফ্যান বডির সাথে সংযুক্ত ক্লু স্প্রিং ওয়াসার ও প্রেসপ্যান পেপার ব্যবহার করুন)।

৯) নাট-বোল্টের সাহায্যে ফ্যানসহ ডাউন পাইপটি ক্লাম্পের (স্যাকেল) সাথে যুক্ত করুন। এক্ষেত্রে একটি বোল্ট, একটি স্প্রিং ওয়াসার, একটি নাট এবং একটি কটার পিন ব্যবহার করুন।

১০) সেফটি স্ট্রিং-এর অন্য মাথা ডাউন পাইপের ভিতর দিয়ে সোজা উপরের প্রান্ত দিয়ে বের করুন এবং সিলিং রডের সাথে একটি প্যাঁচ দিয়ে ক্লাম্পের (স্যাকেল) যে পাশে তিনটি ছিদ্র আছে ঐ পাশের মধ্য ছিদ্রটির সাথে সংযুক্ত করুন। এক্ষেত্রে একটি ফ্ল্যাট ওয়াসার এবং একটি ক্লু ব্যবহার করুন।

১১) এবার ফ্যানের কেবলের সাথে বৈদ্যুতিক কেবলের সংযোগ দিন। কেবল সংযোগের সময় অবশ্যই ফ্যানের সুইচ বন্ধ রাখুন।

বি: দ্র: শুকনা নরম কাপড়ের সাহায্যে ফ্যান পরিষ্কার করুন, ফ্যানের ভিতরে যেন পানি প্রবেশ না করে এবং ফ্যানের পাখা বাঁকা না হয় সেদিকে লক্ষ্য রাখুন।

6.3 Features:

Consumes less than 65 Watt

Maximum Air Delivery.

Speed: 300 RPM.

Additional Safety by providing safety String.

Surface Temperature less than 45°C.

Higher Service Value.

Aerodynamic Blade Design

6.4 Payback period

S. N	Item Description	Unit	Conventional Ceiling Fan	Energypac energy Efficient Ceiling Fan
1	Power Consumption /Fan	Watt	100	65
2	Power saved by Energypac Fan	Watt-hr	35	
		KWhr	0.035	
3	Power saved by Energypac Fan Per year	KWhr	0.035*15*365 =192 (KWh*Avg. Daily usage hour*number of days a year)	
4	Per Unit cost	BDT	5.92	
5	Cost Saved By Energypac ceiling fan	BDT	1136	
Payback Time = (2850/1136)=2.5 years only				
Warranty Period 10 Years.				

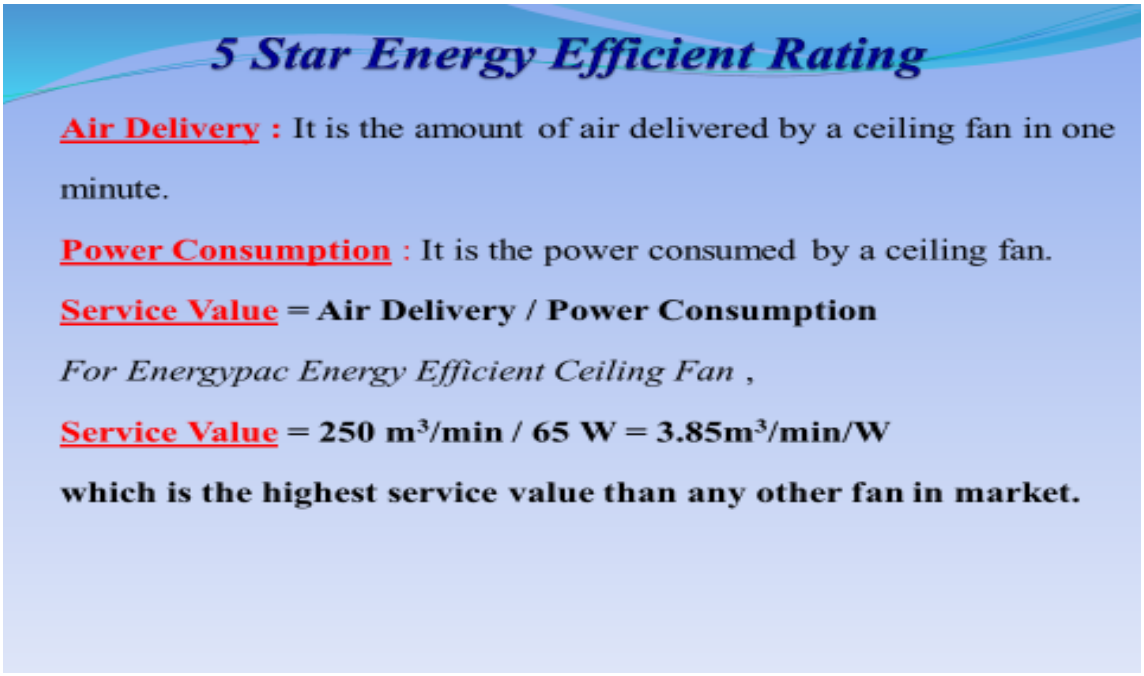
6.5 Energy Efficiency Grade; BDS1860:2012

The energy efficiency grades of AC electric fans shall be divided into 5 grades each indicated by a star, one star being the lowest and five star being the highest in energy efficiency.

The energy efficiency values of all grades of products shall not be lower than those specified in table below. More stars mean more energy efficient.

Type		**Specification (mm)**	**Energy Efficiency value [m^3/ min/Watt]**				
			Energy Efficiency Stars				
			1	2	3	4	**5**
Ceiling fan	**Capacitive type**	1400	3.15	3.24	3.32	3.39	**3.45**

***** More star means more energy efficient*****



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6.6 Product Comparison

Specifications	Unit	Energypac	Competitor 1	Competitor 2	Competitor 3	Competitor 4	Competitor 5
Voltage	Volt	220	220	220	220	220	220
RPM	Rpm	320	300	320	318	320	320
Wattage	Watt	65	75	80	75-82	75	75
Air Delivery	m^3/min	240	215	200	215	240	200
Service Value	m^3/min	3.69	2.87	2.5	2.86	3.20	2.66

	/wat t						
Star Rating	**N/A**	**5**	**-**	**-**	**-**	**-**	**-**

6.7 Certifications

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6.8 Why People will like this Fan?

- ❑ Low Power Consumption
- ❑ Higher Air Delivery
- ❑ Higher Service Value
- ❑ Long Life
- ❑ 5 Star Rating (Service Value ≥ 3.45) and Service value of Energypac energy efficient ceiling fan is 3.84.

- Aerodynamic Blade

6.9 Conclusion

This internship was very successful to me. I have gained new knowledge, skills and met so many new people. Demand of practical work experience has no other alternative in today's job market. Internship is a great opportunity to achieve this experience. The twelve weeks of internship training at 'Energypac Electronics Limited', generated a lot more interest in my subject. It made me more aware of the scope of electronics engineering. In this report I focused on production system of ceiling fan. To complete this report, I visited and study about the industrial production process of, ceiling fan. I have also describing the testing procedure of these appliances. I have compared over academic knowledge with practical knowledge. With all theoretical and practical knowledge, I have completed a report about the industrial production process. The hands on experience gathered through this report will help me to work with confidante in my service life in near feature. I was fortunate to have personal guidance from experienced professionals who took been interest in explaining the working details of various equipments. Finally, by the grace of Allah, through combined effort of my supervisor I have completed my report successfully under the kind support and guidance of my report supervisor. Industrial training is the best way to move forward.

6.4 Appendix

EEL	Energypac Electronic Limited
AC	Alternating Current
DC	Direct Current
ESL	Energy Saving Lamp
Km	Kilometer

PDCA	Plan DO Check Act
CRI	color Rending Index
K	Kelvin
W	Watt
NEMA	National Electrical Manufacturer Association
EPA	Environmental Protection Agencies U.S.
UWR	Universal Waste Rate
PEARL	The program for the Evaluation of Residential Lighting
UNEP	The UN Environmental Program
GEF	Global Environmental Facilities
IQC	Industrial Quality Check
DS	Daylight Spiral

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[1] “Welcome to Energypac Electronics | Energypac Electronics.” [Online]. Available: http://www.energypacelectronics.com/. [Accessed: 20 Dec-2020]

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