EASWARI ENGINEERING COLLEGE
An AUTONOMOUS Institution
Affiliated to ANNA UNIVERSITY
RAMAPURAM CHENNAI

DEPARTMENT OF MECHANICAL ENGINEERING

TECHNICAL MAGAZINE
YEAR: 2019-2020

VISION

To be an acknowledged leader in imparting Mechanical Engineering education, research and be a recognized resource center for industry and society

MISSION

M1:To make the students understand the basic and advanced Engineering concepts in the core fields of Mechanical Engineering through Under-Graduate and Post-Graduate Courses.

M2:To prepare the students and expose them to the basic and applied research, thus fostering creativity through recognized research centers.

M3:To make the students undergo training in the Industries, identify the current problems and solve them with multidisciplinary and professional approach.

M4:To prepare the students to integrate Engineering with business that encourages technological commercialization by inviting eminent entrepreneurs for seminars and workshops.

M5:To make the students do application oriented projects which identify the current problems, solving them and thus contribute to the societal needs.

M6:To inculcate the value of ethics, lifelong learning and widening the knowledge frontiers through long term interaction with other academia and industry.

PROGRAM OUTCOMES (PO)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The Engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAM EDUCATIONAL OBJECTIVES (PEO)

PEO1: Our graduates will have fundamental technical knowledge and develop core competency in diversified areas of Mechanical Engineering along with Mathematics, Science and other allied engineering subjects in a view to expand the knowledge horizon and inculcate lifelong learning.

PEO2: A fraction of our graduates will pursue advanced studies, research and develop products in the field of Mechanical engineering by developing partnerships with industrial and research agencies thereby serving the needs of the industry, government, society and scientific community.

PEO3: Our graduates will be capable of building their own career upon a solid foundation of knowledge and with a strong sense of responsibility serve their profession and society ethically.

PEO4: Our graduates will be prolific professionals with effective communication, leadership, teaming, problem solving, decision making skills by understanding contemporary issues and improve their overall personality for career development

. PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1: Students will be competent in design and analysis of thermal and fluid systems.

PSO2: Students will possess the skill to apply design concepts for mechanical structures and systems.

PSO3: Students will be able to design and develop industrial products using modern machines in the field of manufacturing.

PSO4: Students will be able to use software to solve structural, thermal, fluid and manufacturing problems.

JOURNAL ARTICLE

A NOVEL INTELLIGENT SHORE-TO-SHIP POWER SUPPLY SYSTEM USING COLLABORATIVE MOTOR CONTROL

In this paper, a novel type of intelligent cable lifting device for shore-to-ship power connection systems is proposed. By analyzing the shortcomings of the commonly used lifting methods in inland ports, the structure and control circuit of the new cable lifting device are designed based on collaborative motor control. The reliability and effectiveness of the proposed control strategy are verified by establishing a mathematical model of the motor and through Simulink software simulation analysis. The cable lifting device can adjust the cable delivery position in inland ports. It can, at the same time, significantly reduce manual operation and improve the efficiency of shore-to-ship power connection operation at the port terminal.

1. Introduction

A

B

Maritime transport brings economic benefits to the port and the surrounding cities, but it also has a negative impact on the local environment. In order to maintain the operation of systems, such as handling, lighting, communications, and air conditioning, the ship must provide power to the appropriate equipment during the berthing period. Ships usually generate electricity using auxiliary engines, which typically burn diesel or heavy oil. The combustion of these fuels can result in the emission of large amounts of gaseous pollutants (NO, NO_2, and SO_2) and particles. Studies have shown that long-term exposure to high levels of gaseous pollutants and particles can increase the incidence of respiratory diseases (Adamo et al., 2014; Ćelić et al., 2014; Prousalidis et al., 2014).

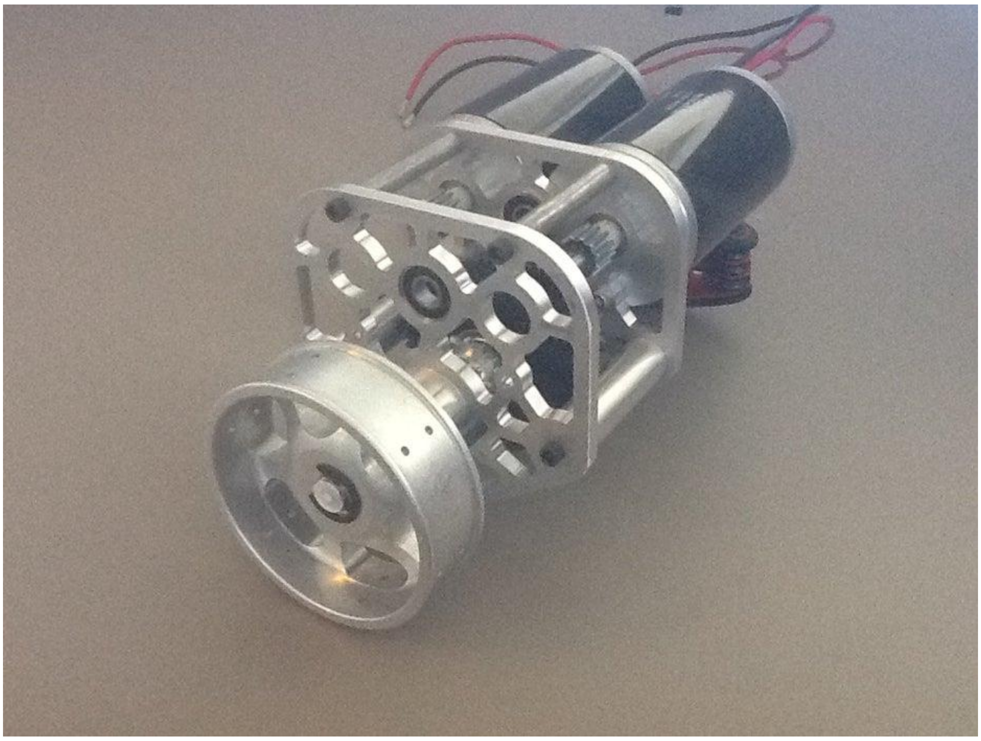
In addition, the use of auxiliary engines makes a lot of noise, further endangering the health of port staff and surrounding residents.

In order to reduce the emission of harbor pollutants, the International Maritime Organization (IMO) has already put new regulatory standards into legislation (Paul et al., 2012; Coppola et al., 2016). At present, measures to reduce ship pollutant emissions include the use of low-sulfur fuel or Liquefied Natural Gas (LNG) as auxiliary engine fuel, the use of scrubbers, the use of shore-to-ship power, and so on (Sciberras et al., 2015; Vicenzutti et al., 2015; Paul et al., 2017). Among them, shore-to-ship power technology can basically eliminate the emission of pollutants during the berthing period. Shore-to-ship power technology requires the installation of specialized equipment onshore and onboard, and ships are usually able to use shore power only at berths (Paul and Haddadian, 2011; Parise et al., 2015; Paul et al., 2018). In recent years, some studies have proposed a floating power platform to provide power for anchored ships (Jayasinghe et al., 2016; Hou, 2017; Kumar et al., 2017; Pan et al., 2018). In 2018, Rene Prenc et al. introduced the concept of High Voltage Shore Connection and its possible application in Croatian ports (Prenc et al., 2018). In the same year, Dev Paul et al. reviewed low-voltage shore connection power systems for ships with up to 1,500 kVA and a voltage of 400–690 V (Paul et al., 2018). Kegalj and Traven (2018) introduced the possibility of implementing high-voltage power supplies in developing countries, using Croatia as an example, and considered their environmental benefits.

Usually, when a ship receives shore power, cables need to be transported from the shore to the ship. At present, there are few dedicated hoisting devices for lifting cable for shore-to-ship power connection systems in inland ports, and cable transportation mainly depends on a universal crane or a fixed spreader. For example, in the Three Gorges Dam area of China along the Yangtze River, there are some shore-to-ship power charging piles that were installed by China State Grid Corporation. Due to the lack of a suitable intelligent shore-to-ship connection system, these shore-to-ship power charging piles have not been used properly until now. Figure 1 shows the two new and unused shore-to-ship charging piles and their location on the bank of the Yangtze River in the Three Gorges Dam area.

HOW TO DO

HOW TO MAKING A 2-SPEED CUSTOM GEARBOX



This tutorial will show how I created a custom 2-speed shifting gearbox. As a student in the FIRST Robotics Competition (FRC), I became heavily involved with designing and building my team's drivetrain and chassis. Though the chassis was custom designed and fabricated, we always used commercially produced gearboxes due to time and resource constraints. As I looked at some other teams' robots, I was amazed by their beautiful custom gearboxes that perfectly fulfilled their design goals. Seeing these other designs inspired me to try making one of my own, even though producing it would be impractical for my team during the actual build season.

This project was really just me having fun before I graduated from my high school, where I had access to the machining equipment necessary to complete the project. Unfortunately, I did not have enough time to finish all of the parts. However, I do have enough to give a very clear idea of what it will look like. Though the gearbox was designed to be used on a FRC robot, it will probably never see use.

This tutorial was made through the Autodesk FIRST High School Intern program.

- Materials
- Aluminium Plate
- Aluminium Tube
- Aluminium Hex Bar
- Gears
- Bearings
- Motors
- Bolts

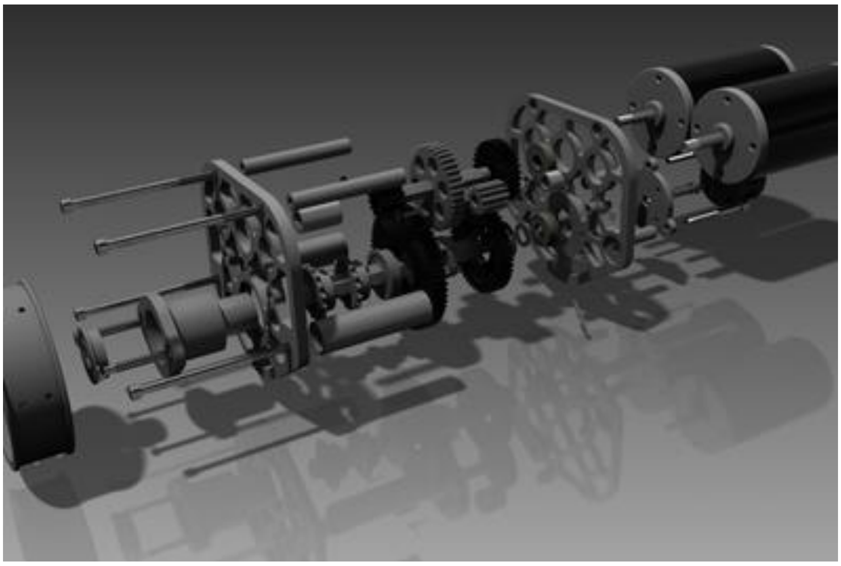
The PDF attached to this step is a complete Bill of Materials for this project. It includes information such as the quantity, cost, material type, and vendor for many of the required parts.

- Tools
- CNC Mill
- Lathe
- Band Saw

3D Printer

Step 1: Designing the Gearbox

The design of this gearbox was heavily inspired by other FRC teams who posted pictures or full 3D models of their designs. Admittedly, I am not the most creative designer (steal from the best, invent the rest, right?), so the inspiration is fairly obvious. In particular, the design was inspired by Team 254 and Team 973, who have been gracious enough to share their designs.



I designed my gearbox entirely in Autodesk Inventor before purchasing a single part. I started by choosing a gear ratio (which you can learn more about here), and then ensured that there would be no clearance issues between the rotating parts using the sketch shown in the second picture. the rest of the gearbox, part by part. Throughout the design process, I had to ensure that I could make each part that I designed on the tools available to me.

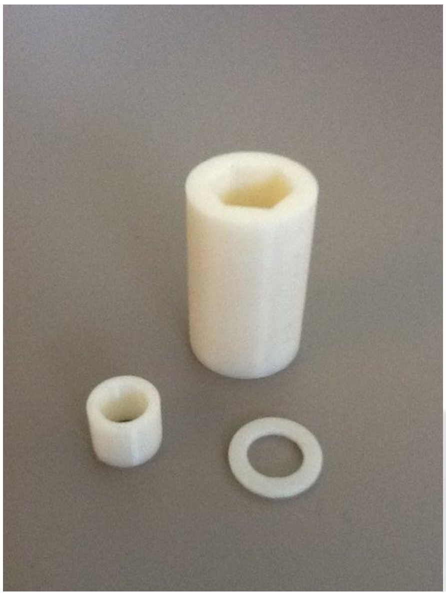
Step 2: Milled Parts

There were a total of four parts that needed to be milled, each of which was distinct. Using a CNC mill to machine the parts requires the creation of G-code to control the tool. I did this by taking the 3D models I created in Inventor and importing them into the Computer Aided Manufacturing (CAM) program MasterCAM. After defining how I wanted the mill to machine my parts, I set them up on the CNC mill in the first picture. The next four pictures are of the parts I made using the mill. Finally, the sixth picture is of a workholding jig I printed out on a 3D printer to hold one of the parts while it was being machined.

Step 3: Lathed Parts

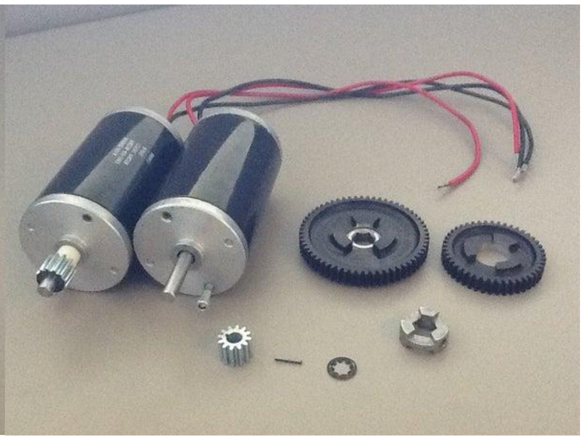
Next I had to make several parts on a lathe. These parts were the spacers that separate the gearbox and the axles that the gears spin on. I used the small bench top lathe pictured to machine all of these parts.

Step 4: 3D Printed Parts



The final set of parts were made using a 3D printer. This manufacturing method was chosen because the parts would not experience high loads and because they may have been tricky to machine using traditional methods.

Step 5: Purchased Parts

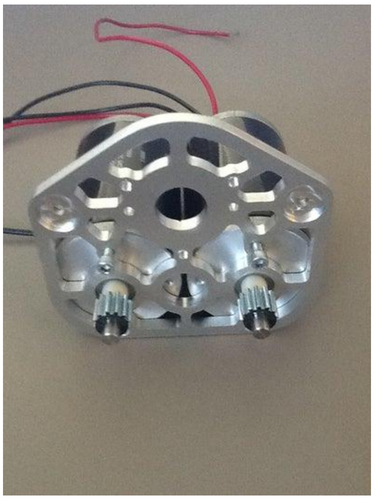
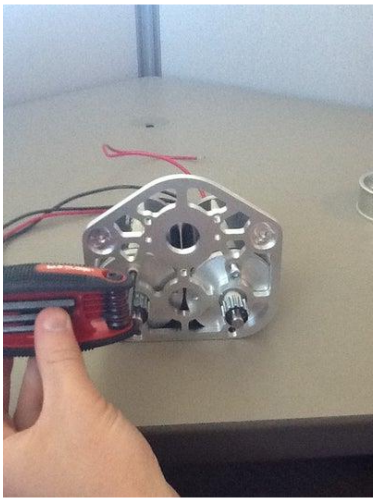


These two pictures are of all of the parts I purchased, instead of machined, to make this gearbox. The three suppliers I purchased parts from are McMaster Carr, AndyMark, and WestCoast Products.

Step 6: Motor Assembly


First, we must assemble the motor. The second picture shows how to place the plastic spacer on the shaft and insert the key into the motor shaft's keyway. Now, the 12 tooth pinion gear can be slid on, followed by pressing on the retainer ring using a 3/8" socket wrench, as shown in pictures three through five. Repeat this process for each of the CIM motors.

Step 7: Motor and Bearing Installation

Next, we install the motors on the aluminum plate. Simply insert the motors into their holes, line up the screw holes, and tighten a self locking 10-32x.5" screw into each of the holes, as shown in the first three pictures.

We also have to press several 3/8" bearings into place. Pictures four through six show the three locations where these bearings are installed.

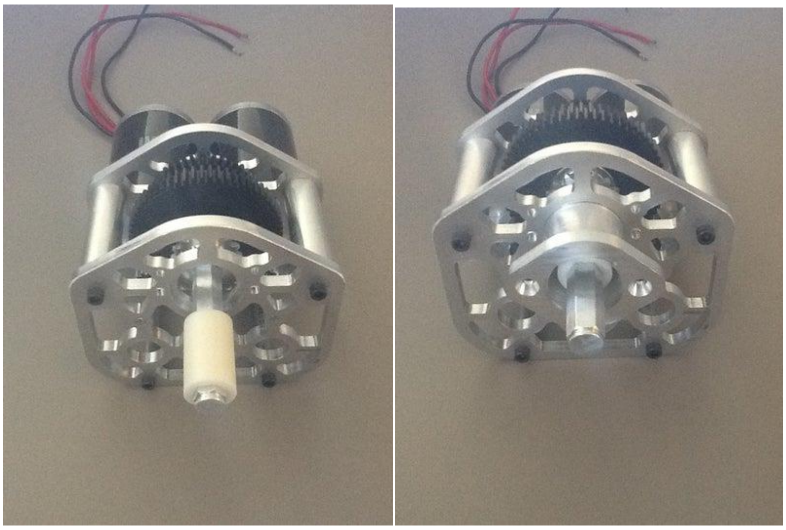
Step 8: Output Shaft Assembly

Now we will assemble the output shaft and place it in the gearbox. First, we must install the e-clip ring in the center of the shaft. I did this by pressing down on the ring with the shaft against a hard surface, as shown in the first picture. Pictures two and three show how I slid the dog shifting gear, 45 tooth dog gear, and small 3D printed spacer onto one end of the shaft. Next, I slid the output shaft into the lower bearing on the previously assembly plate, as shown in picture four. Finally, pictures five through seven show how to install the 60 tooth dog gear and 16 tooth sprockets on the 1/2" hex shaft.

Step 9: Case Assembly

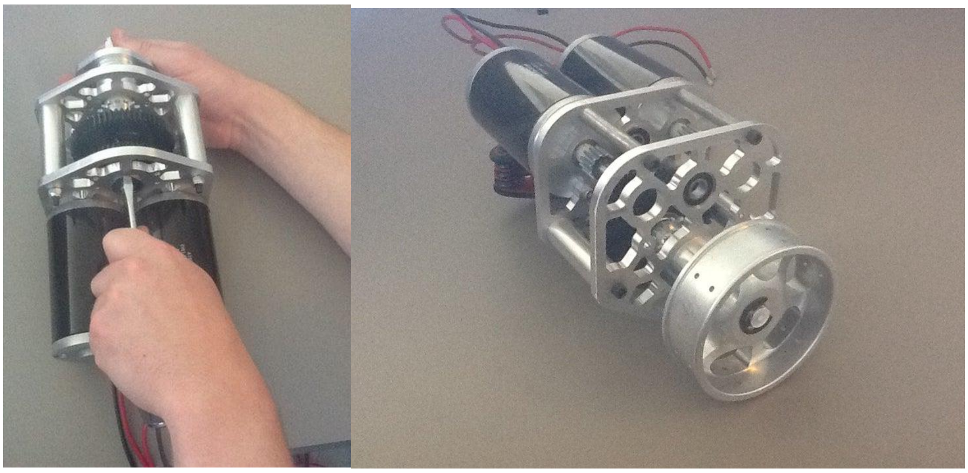
In this step, we will assemble the rest of the gearbox case. First, I pressed the final 3/8" bearing into the center top hole shown in the first picture. In the second and third pictures, I placed the aluminum spacers in their holes on the first plate and then aligned the second plate with the spacers. The gearbox plates have shoulders for the spacers to ensure that the plates are aligned. Next, I slid the four 3.5" 10-32 screws through the four holes shown in the fourth picture. In the fifth picture, I used a 5/32 hex wrench to tighten the bolts that screwed into the motors. Then, I used a socket wrench to install nylock nuts on the remaining two bolts. This setup and its result are shown in the sixth and seventh pictures.

Step 10: Bearing Block Assembly



Now we will install the bearing block, which will support the output shaft and would be used in connecting the gearbox on a robot. I first slid the large 3D printed spacer on the hex shaft, as shown in picture one. Next, I slid the bearing block into the milled shoulder on the front gearbox plate. I then inserted and tightened down the two 1.5" 10-32 countersunk screws using a 1/8" hex wrench, as shown in the third picture. Finally, I installed the 1/2" hex bearing by sliding it onto the shaft and into the the bearing raceway on the bearing block. This process is shown in the fourth and fifth pictures.

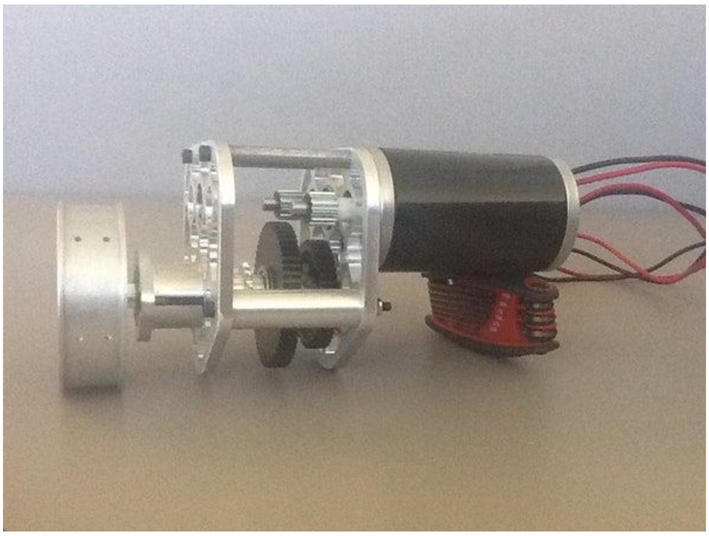
Step 11: Final Assembly



In this final step, we will install the wheel and several snap rings. First, I pressed on the 3/8" snap ring at the end of the output shaft shown in the first picture by pressing down on it with a flat bladed screwdriver, as shown in the second picture. I then slid the 4" aluminum wheel onto the output shaft as seen in the third picture. Finally, I installed the 1/2" snap ring at the front of the output shaft. I did this by first placing it on the grove as in picture four and then pressing down on it with a flat object, such as a screwdriver.

The installation of the 1/2" snap ring is as close to completion of the gearbox as this tutorial can go. Unfortunately, I ran out of time to manufacture several of the necessary parts, leaving the gearbox in an incomplete state.

Step 12: Finished Product, Lessons Learned



The pictures above show my gearbox as it exists currently. There are still two major sections missing: the top shaft, where all the gear reduction occurs, and the shifting mechanism, which shifts gears by alternating which gear on the bottom shaft is transmitting torque. I plan to finish these the parts for these two sections when I have access to the necessary materials and machine tools.

Here are some lessons I learned from making this gearbox:

Ensure that you have sized holes properly for bolts and motors - I ended up having to modify the holes the CIMs are mounted in by manually sanding them down.

Control tool chatter when milling parts - resulted in a few parts with bad surface finishes and even caused some parts to be over-sized

When used properly, CAD is an incredibly powerful tool. Because of it, I didn't have to redo a single part for reasons other than manufacturing errors.

Even though it is not yet finished, I am quite pleased with how my gearbox has turned out.

INDUSTRY NEWS

ARTIFICIAL MUSCLES ACHIVE POWERFUL PULLING FORCE

As a cucumber plant grows, it sprouts tightly coiled tendrils that seek out supports in order to pull the plant upward. This ensures the plant receives as much sunlight exposure as possible. Now, researchers at MIT have found a way to imitate this coiling-and-pulling mechanism to produce contracting fibers that could be used as artificial muscles for robots, prosthetic limbs, or other mechanical and biomedical applications.

While many different approaches have been used for creating artificial muscles, including hydraulic systems, servo motors, shape-memory metals, and polymers that respond to stimuli, they all have limitations, including high weight or slow response times. The new fiber-based system, by contrast, is extremely lightweight and can respond very quickly, the researchers say. The findings are being reported today in the journal *Science*.

The new fibers were developed by MIT postdoc Mehmet Kanik and MIT graduate student Sirma Örgüç, working with professors Polina Anikeeva, Yoel Fink, Anantha Chandrakasan, and C. Cem Taşan, and five others, using a fiber-drawing technique to combine two dissimilar polymers into a single strand of fiber.

The key to the process is mating together two materials that have very different thermal expansion coefficients — meaning they have different rates of expansion when they are heated. This is the same principle used in many thermostats, for example, using a bimetallic strip as a way of measuring temperature. As the joined material heats up, the side that wants to expand faster is held back by the other material. As a result, the bonded material curls up, bending toward the side that is expanding more slowly.

Using two different polymers bonded together, a very stretchable cyclic copolymer elastomer and a much stiffer thermoplastic polyethylene, Kanik, Örgüç and colleagues produced a fiber that, when stretched out to several times its original length, naturally forms itself into a tight coil, very similar to the tendrils that cucumbers produce. But what happened next actually came as a surprise when the researchers first experienced it. "There was a lot of serendipity in this," Anikeeva recalls.

As soon as Kanik picked up the coiled fiber for the first time, the warmth of his hand alone caused the fiber to curl up more tightly. Following up on that observation, he found that even a small increase in temperature could make the coil tighten up, producing a surprisingly strong pulling force. Then, as soon as the temperature went back down, the fiber returned to its original length. In later testing, the team showed that this process of contracting and expanding could be repeated 10,000 times "and it was still going strong," Anikeeva says.

CASE STUDY

"Smart Manufacturing in the Aerospace Industry" (2019)

Background:

The aerospace industry is known for its stringent quality standards, complex manufacturing processes, and the need for precision engineering. In 2019, a leading aerospace manufacturer faced challenges in optimizing their production processes, reducing costs, and improving product quality. They turned to advanced technology solutions to transform their manufacturing operations.

Problem Statement:

- The aerospace manufacturer was facing several challenges, including:
- High production costs due to manual and labour-intensive processes.
- Quality control issues leading to product defects and rework.
- Difficulty in meeting tight delivery schedules.

Solution: To address these challenges, the aerospace manufacturer implemented a comprehensive smart manufacturing solution in 2019. This solution integrated various cutting-edge technologies into their production processes:

Internet of Things (IoT) Sensors: Thousands of IoT sensors were installed on manufacturing equipment to monitor parameters such as temperature, pressure, and machine health in real-time. These sensors continuously collected data and transmitted it to a central control system.

Big Data Analytics: A powerful analytics platform processed the massive amounts of data generated by IoT sensors. It identified patterns, anomalies, and potential issues in the manufacturing process. This data-driven approach allowed for predictive maintenance and reduced machine downtime.

Artificial Intelligence (AI) and Machine Learning: AI algorithms were employed to optimize production scheduling, predict equipment failures, and improve quality control. Machine learning models were trained to detect defects and anomalies in real-time, minimizing the risk of producing faulty components.

Automation and Robotics: The manufacturer introduced robotic systems for tasks such as welding, painting, and assembly. These robots worked alongside human operators, enhancing efficiency and precision while reducing the risk of repetitive strain injuries.

Results:

The implementation of these technologies led to significant improvements in the aerospace manufacturer's operations:

Cost Reduction: By optimizing production processes and reducing downtime, the manufacturer achieved a 15% reduction in production costs.

Quality Improvement: The defect rate decreased by 20%, resulting in higher-quality aerospace components and fewer rework expenses.

On-Time Deliveries: The improved scheduling and automation helped the manufacturer consistently meet tight delive-ry schedules, enhancing customer satisfaction.

Employee Safety: Automation and robotics reduced the risk of workplace injuries, creating a safer working environment for employees.

Environmental Impact: By optimizing processes and reducing waste, the company also reduced its carbon footprint.

Conclusion:

This case study demonstrates how the integration of advanced technologies, including IoT, big data analytics, AI, and automation, can revolutionize manufacturing processes in the aerospace industry. In 2019, this aerospace manufacturer successfully harnessed these technologies to achieve cost savings, improve product quality, and ensure on-time deliveries, ultimately enhancing its competitiveness in the market.

EVENTS HELD DURING 2019-2020

MEMORANDUM OF UNDERSTANDING

Department of Mechanical Engineering has signed Memorandum of Understanding (MoU) with leading industries for organization of workshops /seminars/guest lectures/ training programs/internship for the students and faculty.

OUTCOME OF MOU

- Facilitating Internships and Live Projects for Students, thereby giving an opportunity for Students to gain experience of working in a real Engineering Environment to learn and build on their potential.
- Consultancy and R&D works can be carried out by the faculty members.
- Encourage Entrepreneurship among Students through thought leadership sessions and Industry service partner program.
- Technical Sessions and Workshops for the Students.
- Frequent visits of 'Institute' and 'Industry' to exchange ideas and explore the possibilities in Engineering and Technology.
- Introduction of Scholarships and other Reward Programs.
- Opportunities for fundamental and applied Research Projects.

Webinar series on “CAREER READY”

Topic : Webinar Series

Duration : 11-05-2020 to 16-05-2020

Time: 3:00 pm to 4:00 pm

Venue: Easwari engineering college via Video Conference

SAE Collegiate Club of Easwari Engineering College conducted an online webinar series, titled “CAREER READY” from 11/05/2020 to 16/05/2020 around 3:00 pm to 4:00 pm exclusively for SAE Membership students, III and IV-year students. Students from various colleges all over Tamil Nadu actively participated in this event. Dr Vetrivel Sezhian, HOD Mechanical welcomed the all participants and Dr. V. Antony Aroul Raj, Professor, Mechanical briefed the scope of the event to the participants. The webinar was graced byMr. S. Shanmugam, Founder director of Design Desk (India) Pvt . Ltd. and is also the chairman of SAE India southern section. Mr. A. Deepan Raj Kumar and Mr. S. Thiagarajan, Assistant professors in Mechanical Engineering, coordinated the event, along with the student coordinator, Mr.Kailash , from IV-year Mechanical Engineering. The students, who participated in this event, learnt about the necessities and pre-requisites before heading straight into our career of our choice, which involves having practical experience, proper communication skills, a problem-solving ability and the ability to manage various projects, all to be done while following a set of codes and standards.

EVENT ON "AEROMODELLING CONTEST"

Topic : Aeromodelling design

Date : 27-05-2020

Time : 9:00 am to 10:00 am

Venue : Easwari engineering college via Video Conference

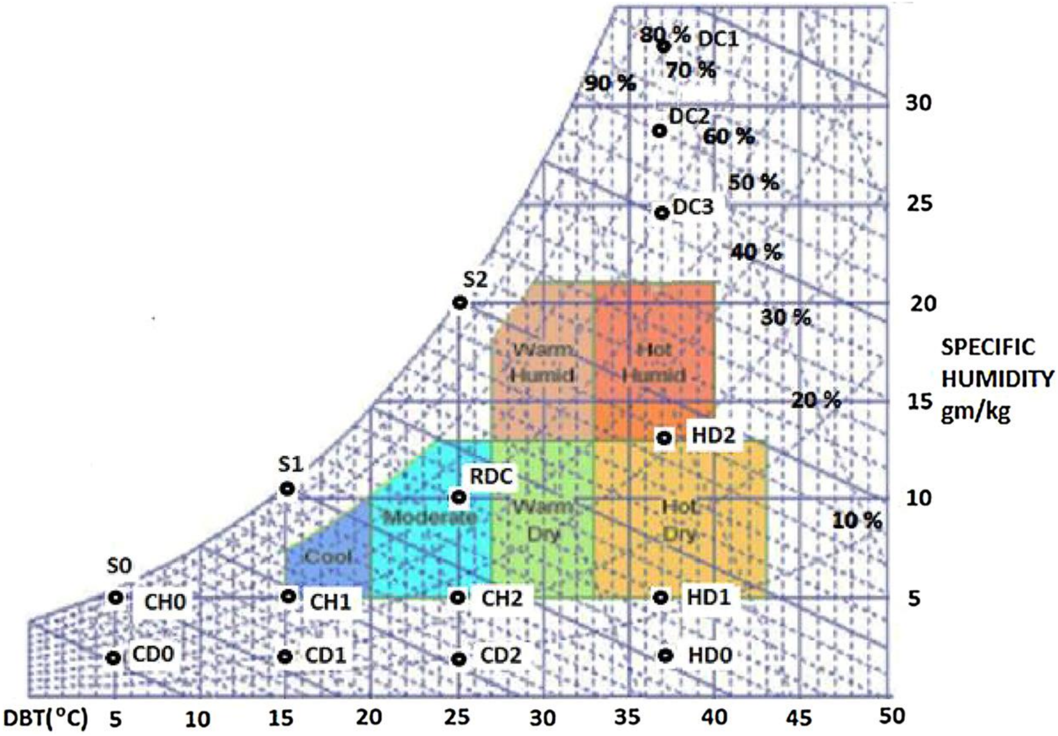
SAE Collegiate Club of Easwari Engineering College conducted an online event "Aeromodelling Contest" on 27/05/2020 from 9:00 am to 10:00 am exclusively for +1, +2 & final year diploma students. Students from various schools all over Tamil Nadu actively participated in this event. Dr M.Vetrivel Sezhian, HOD Mechanical welcomed the all participants and Dr.V.Antony Aroul Raj, Professor, Mechanical briefed the scope of the event to the participants.

Deepan Rajkumar, AP/Mechanical, coordinated the event along with the student coordinator Kailash, Mechanical.

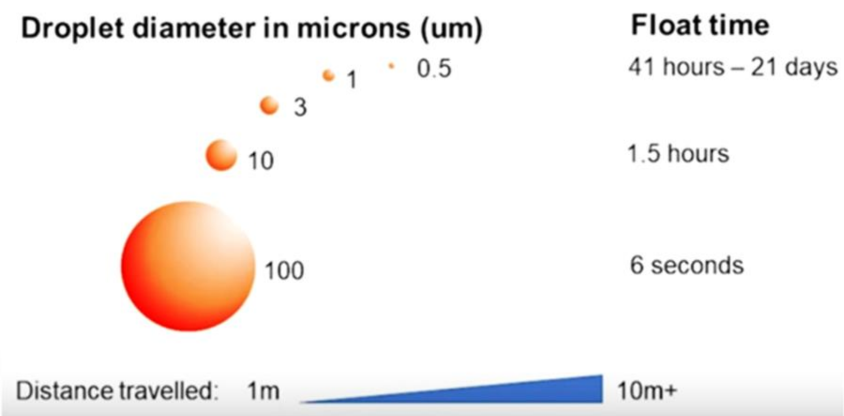
The students, who participated in this event, learnt about the knowledge on wing shape & air foil shape and basic aviation techniques. The contest provided the right platform to give wings of knowledge to aerodynamics

INTERNATIONAL JOURNAL PUBLICATION

V Antony Aroul Raj, R Velraj, Fariborz Haghighat "The contribution of dry indoor built environment on the spread of Coronavirus: Data from various Indian states" elsevier 62 (2020) impact factor : 4.5



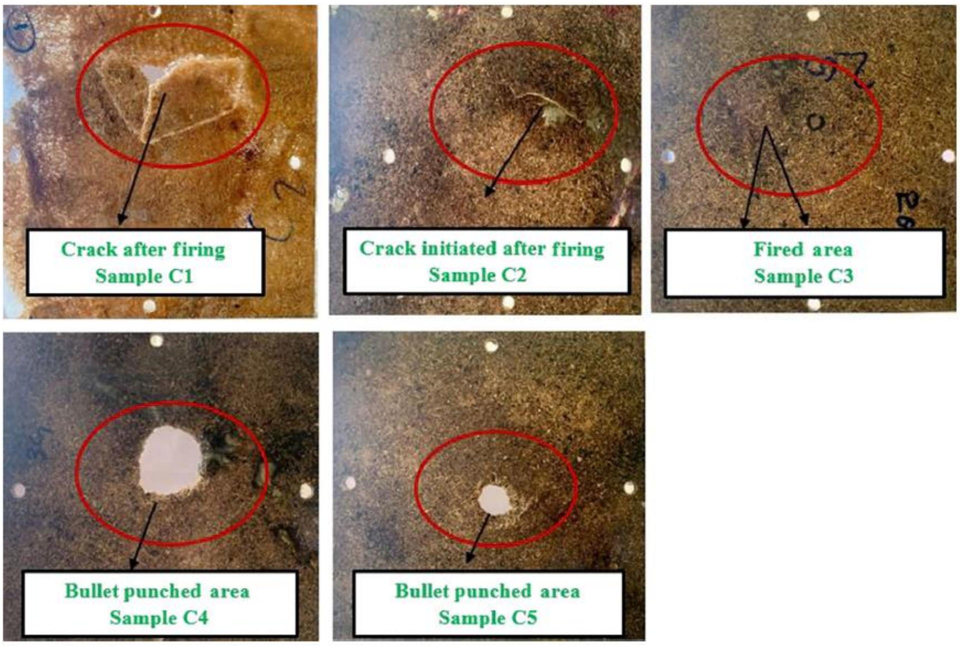
Coronavirus transmission potential in various climatic zone in Psychrometric chart



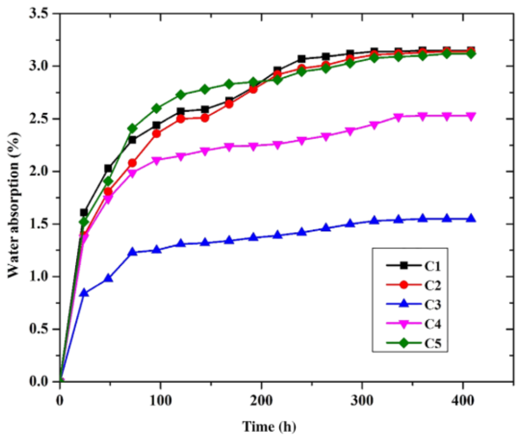
Respiratory droplets shrink and become airborne when air is dry

INTERNATIONAL JOURNAL PUBLICATION

K. G Ashok, K Kalaichelvan "Mechanical, ballistic impact, and water absorption behaviour of luffa/graphene reinforced epoxy composites" Polymer Composites. 1–11(2020) impact factor : 2.89



Ballistic impact tested samples of various composites



Moisture absorption behaviour of composite samples

Academic Year (2019-2020)

Sl. No.	Name of the faculty	Research Paper Title	Index	Impact factor	Month & Year	Volume/ Issue/ Pg. no.	Journal Name
1.	Prasanna Raj Yadav S. Karthick S. Senthilnathan K.	Fundamental droplet evaporation and engine application studies of an alternate fuel produced from waste transformer oil	SCIE	6.609	October - 2019	Volume 259, Article number 116253	Fuel
2.	Prasanna Raj Yadav S.	Impact of fuel injection pressure on the engine characteristics of CRDI engine powered by pine oil biodiesel blend	SCIE	6.609	March - 2020	Volume 264, Article number 116760	Fuel
3.	Antony Aroul RajV	Effect of phase change material integration in clay hollow brick composite in building envelope for thermal management of energy efficient buildings	SCIE	2.692	August - 2019	Volume 43, Issue 4, Pages 351-364	Journal of Building Physics
4.	Ashok, K.G., Damodaran, A	Effect of Nano Fillers on Mechanical Properties of Luffa Fiber Epoxy Composites	SCIE	3.507	June - 2020	Vol 19 / Issue 4	Journal of Natural Fibers
5.	Radhika.K	Waste heat recovery through cascaded thermal energy storage system from a diesel engine exhaust gas	SCIE	2.326		Vol 43 / Issue 1	International Journal of Ambient Energy
6.	Radhika, K.	An insight into the stress corrosion cracking resistance of friction stir processed and micro arc oxidation	SCIE	2.069	April - 2020	Vol 236 / Issue 2	Proceedings of the Institution of Mechanical Engineers, Part C: Journal of Mechanical

		coated ZE41 grade magnesium alloy					Engineering Science
7.	Ravivarman R.	Performance enhancement of normal contact ratio gearing system through correction factor	ESCI	1.495	September - 2019	Volume 13, Issue 3, 2019, Pages 5242-5258	Journal of Mechanical Engineering and Sciences
8.	Ramadoss R.	Grey relational analysis-based optimisation of input parameters of incremental forming process applied to the AA6061 alloy	SCIE	0.743	May - 2020	Volume 44, Issue 1, Pages 93-104	Transactions of Famena
9.	Yuvaraj G.	Experimental research on hybrid natural/glass fiber based epoxy composite	Scopus	1.25	October - 2019	Volume 9, Issue 1, October 2019, Pages 3359-3362	International Journal of Engineering and Advanced Technology
10.	Billy D., PaulmarPushparaj J VetrivelSezhian M., Omshakthivel U.	Structural and mechanical design of solar tracking system	Scopus	1.25	September - 2019	Vol 8, Issue 6 Special Issue 3, September 2019, Pages 1425-1431	International Journal of Engineering and Advanced Technology
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Thank You!

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