SRECHARAN SELVAM | srecharan@gmail.com
COLLEGE OF ENGINEERING | Fall 2023

ABOUT ME

I am currently an undergrad student in Mechanical Engineering at Sri Sivasubramaniya Nadar College of Engineering, Chennai, India (https://www.ssn.edu.in/)

I believe that engineers have a crucial role in shaping the world into a better place. I strive to be part of a company/team motivated to be creative thinkers and not afraid to change the current status quo. As an SSN college Mechanical Engineering B.E Student with depth in Design and Manufacturing, I am prepared to leverage my problem-solving skills to design creative solutions for challenging problems in the manufacturing domain. I have 1 + year of research experience at SSN college of engineering ranging from linear friction welding, additive manufacturing-selective laser sintering, friction stir-back extrusion, MAO coating, Equal channel angular pressing, cold pressure welding, and CNC machining.

As my vision became more apparent, I wanted to broaden my technical knowledge and understanding of manufacturing processes and related areas. With more potential and ability, I can commit myself to the large-scale transformation of manufacturing. I anticipate collaborating with manufacturing firms, improving manufacturing technologies, and ultimately creating a consequential impact through revived and enriched manufacturing technologies.

RESEARCH INTERESTS

- ADDITIVE MANUFACTURING.
- ADVANCED MANUFACTURING.
- MANUFACTURING SYSTEMS
- INDUSTRY 4.0.
- WELDING TECHNOLOGIES.
- OPTIMIZATION.
- MACHINE AND PRODUCT DESIGN.
- MATERIALS AND METALLURGY.

RELEVANT SKILLS

SOFTWARE:

- CATIA V5
- FUSION 360
- PTC CREO
- ANSYS
- AUTOCAD
- ABAQUS

PROGRAMMING:

- C++
- PYTHON
- MATLAB
- CNC TRAIN (G&M CODE)
- ARDUINO

TOOLS:

- MS OFFICE
- MS EXCEL
- ORIGIN
- IMAGEJ
- PHOTOSHOP
- MENDELEY

SOFT SKILLS:

- QUICK LEARNING
- PROBLEM-SOLVING
- TEAMWORK
- DECISION MAKING

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EDUCATION

B.E in MECHANICAL ENGINEERING
2019 – 2023

CBSE (10th and 12th)
2005 – 2019

EXPERIENCE

MANUFACTURING ENGINEER
May ’22 - Aug ’22

MECHANICAL ENGINEER
Jun ’21 - Aug ’21

CHAPTER 1 – RESEARCH

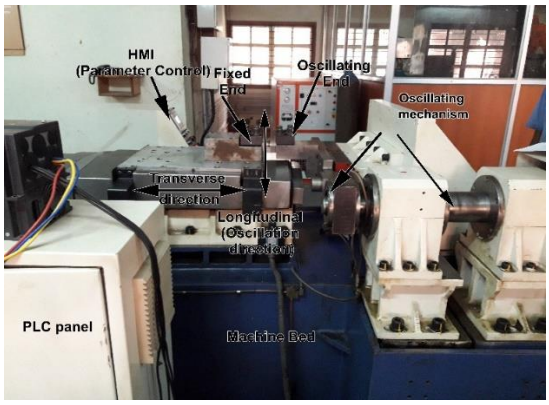
1. Role of Oscillation Frequency and Amplitude on the Microstructure and properties of Linear Friction Welded Nickel Aluminium Bronze joints.

NOV'2021 – PRESENT

FIRST AUTHOR

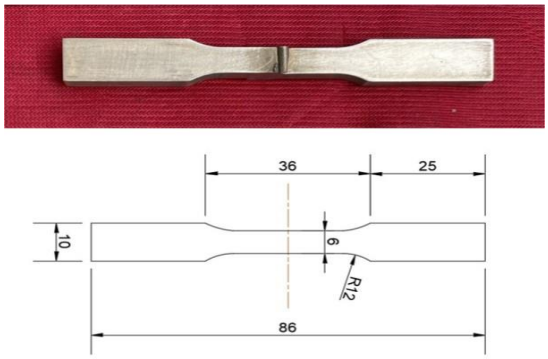
STATUS: JOURNAL REVIEWING STAGE

DRIVE LINK: https://rotf.lol/j4uckuf4. (Password: srecharan)

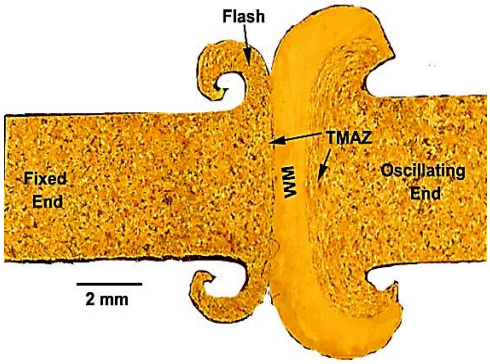


LFW MACHINE

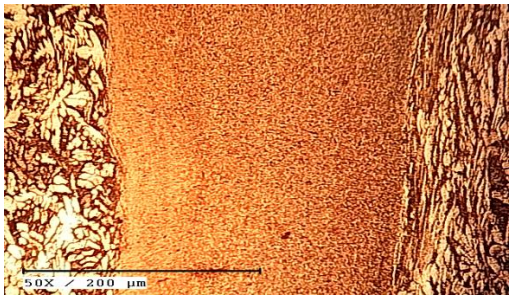
WELDED SAMPLES



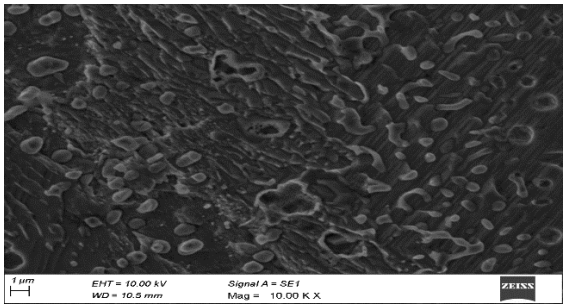
TENSILE TESTING SAMPLE



MACRO IMAGE



OPTICAL MICROSCOPE



SEM IMAGE

1. Role of Oscillation Frequency and Amplitude on the Microstructure and properties of Linear Friction Welded Nickel Aluminium Bronze joints.

NOV'2021 – PRESENT

FIRST AUTHOR

STATUS: JOURNAL REVIEWING STAGE

DRIVE LINK: https://rotf.lol/j4uckuf4. (Password: srecharan)

OVERVIEW

I worked with A.K. Laksminarayanan, my manufacturing professor and lab instructor to investigate the Influence of Oscillation Parameters on Linear Friction Welding of Nickel-Aluminium-Bronze. The c98500 grade Nickel Aluminium Bronze alloy used for the investigation was originally a cast billet. A linear friction welding machine (Frequency range 15-100 Hz, Amplitude range 0.5 to 5 mm, Maximum force of 200 kN) with two hydraulic actuators- one to oscillate the workpiece to be joined and other one to apply a lateral load to the stationary workpiece - was used to perform the welding. We investigated the link between process parameters and weld quality by examining the microstructure, macrostructure, ultimate tensile strength, yield strength, and microhardness. A manuscript was written to detail the findings and results. We forwarded the study to "The CIRP Journal of Manufacturing Science and Technology (Elsevier)." The journal is now reviewing the manuscript.

TECHNICAL DETAILS

NICKEL ALUMINIUM BRONZE ALLOY (NAB) c98500 – LINEAR FRICTION WELDING (LFW) – FREQUENCY & AMPLITUDE – SAMPLE MOUNTING & POLISHING – EDM WIRE CUTTING (TENSILE) – MICROSTRUCTURAL ANALYSIS – OPTICAL & SCANNING ELECTRON MICROSCOPE – ULTIMATE TENSILE MACHINE – CATIA V5 – IMAGEJ – ORIGIN

RESULTS

By varying the frequency and amplitude, we were able to offer the optimal oscillating characteristics for the LFWed NAB alloy. We asserted that samples welded at 50 Hz and 2 mm amplitude provide remarkable consistency and durability.

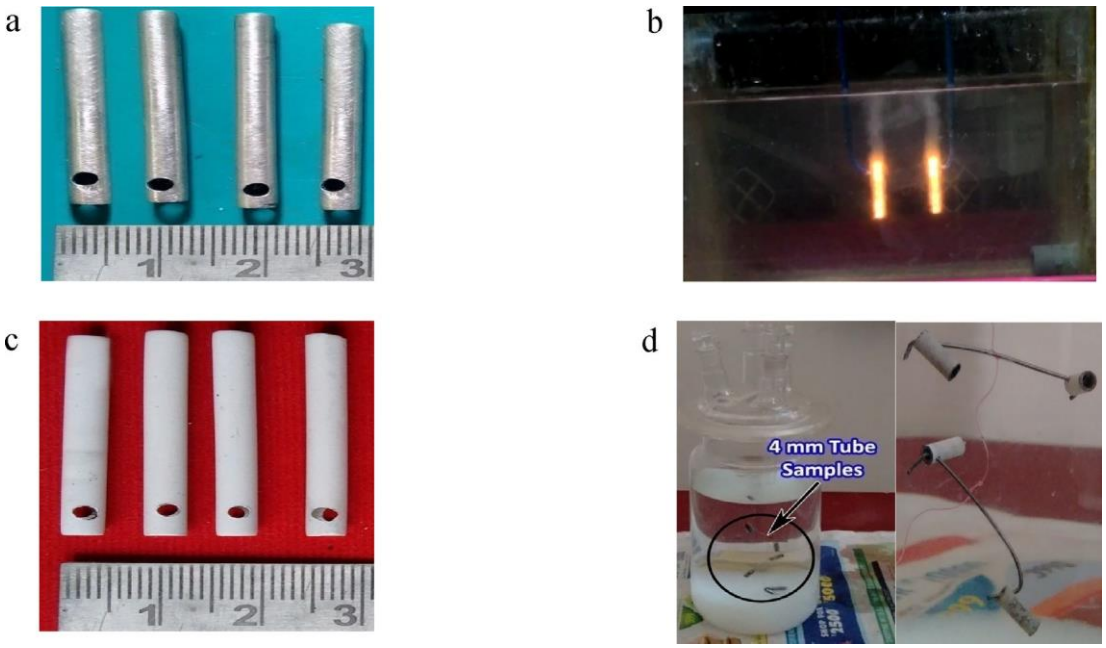
2. Unravelling The Role of Micro-Arc Oxidation Process Factors on Microhardness and Corrosion Resistance of Magnesium Alloy Microtubes.

FEB'2020 – OCT'2022

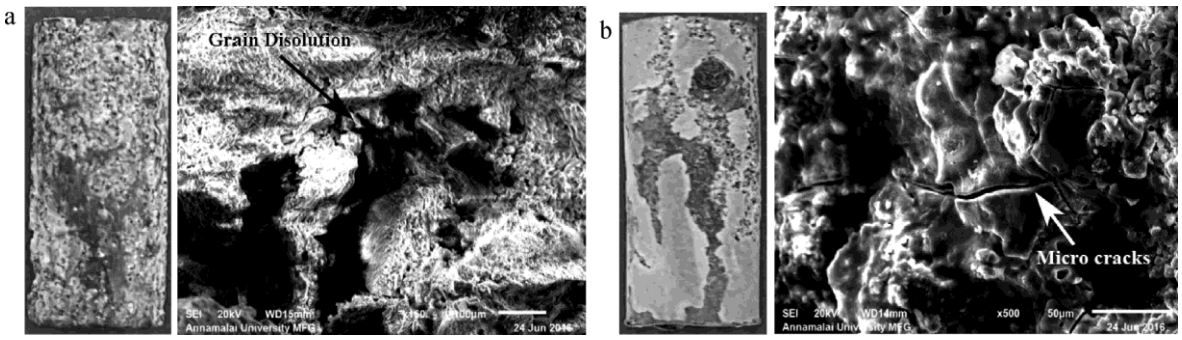
CO - AUTHOR

STATUS: PUBLISHED

DOI LINK: https://doi.org/10.1016/j.matpr.2022.09.451.



(a) Tubes before coating, (b) Arcing of tubes, (c) Tubes after coating, (d) Micro-tubes suspended in an immersion



Surface of uncoated and coated microtubes after 12 days immersion (a) As-fabricated tube surface (b) MAO coated microtubes.

2. Unravelling The Role of Micro-Arc Oxidation Process Factors on Microhardness and Corrosion Resistance of Magnesium Alloy Microtubes.

FEB'2020 – OCT'2022

CO - AUTHOR

STATUS: PUBLISHED

DOI LINK: https://doi.org/10.1016/j.matpr.2022.09.451.

ABSTRACT:

This study employed Micro Arc Oxidation (MAO) to coat ceramic-based coating on fabricated microtubes for biological applications. Although there is information on the MAO coating of sheets and plates, there is relatively little technical information on applying the MAO method to tubes. The impact of crucial MAO process parameters such as current density, inter-work distance, and coating time on the microstructure, porosity, and corrosion resistance of MAO coating deposit on friction stir back extrusion magnesium alloy microtube was studied. The central composite rotatable design was used to conduct experimental runs involving three parameters, modified at three distinct levels. According to the design matrix, cross- sectional images of MAO-coated magnesium microtube were used to quantify interface microstructure. The porosity and corrosion resistance of coated microtubes were tested in a simulated body fluid environment, and the results were connected with process variables using an empirical connection. The usage of MAO coating has been found to have promising outcomes in extending life, lowering corrosion degradation rates, and improving mechanical integrity.

RESULTS

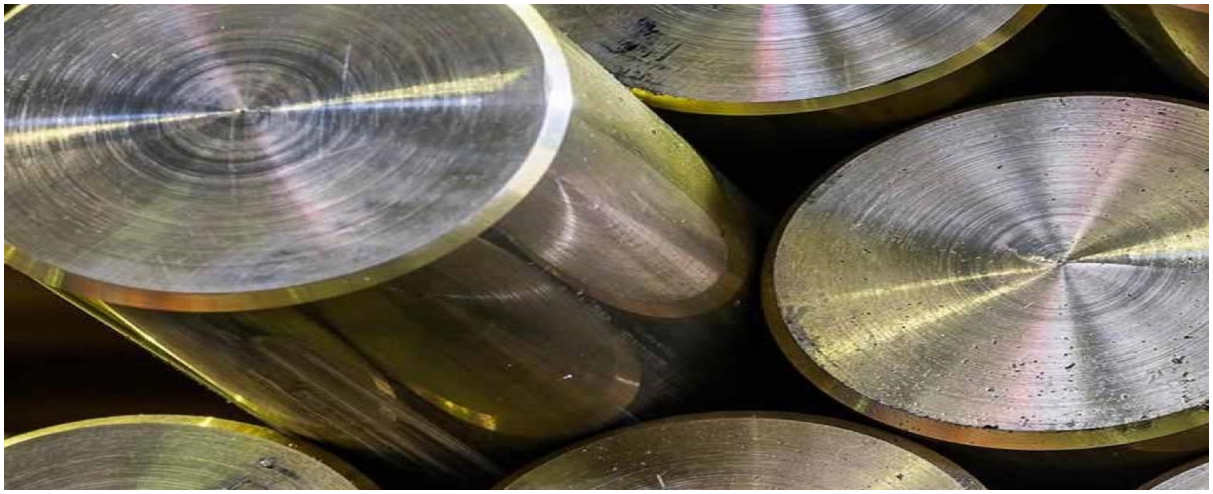
According to the results of the numerical optimization, the best MAO coating parameters for achieving minimum values of 2.6 percent porosity and 2.69 MPa for corrosion rate and distance between tube axes were current density of 654 A/m2, distance between tube axis of 9.6 mm, and coating period of 21.3 min.

HONORS AND AWARDS

We placed top 5 in the "Paper Presentation" event conducted by the International Conference on Processing and Characterization of materials. The research paper won the Best Paper Award at the event, which was also attended by 50+ other participants who presented papers on various topics relating to materials and manufacturing processes.

3. Microstructure and Mechanical properties investigation of Cold Pressure Welded Nickel-Aluminium-Bronze Alloy.
AUG'2022 – PRESENT
FIRST AUTHOR
STATUS: ONGOING (MAY 2023)
PROJECT PHASE 1 PPT LINK: https://tiny.one/36jn3tmx.

COLD PRESSURE WELDING MACHINE



NICKEL ALUMINIUM BRONZE ALLOY (RODS)

3. Microstructure and Mechanical properties investigation of Cold Pressure Welded Nickel-Aluminium-Bronze Alloy.

AUG'2022 – PRESENT

FIRST AUTHOR

STATUS: ONGOING (MAY 2023)

PROJECT PHASE 1 PPT LINK: https://tiny.one/36jn3tmx.

ABSTRACT

Cold pressure welding is a solid-state welding process which is capable of joining non-ferrous metals without heat through application of pressure. This process is capable of producing efficient joints stronger than the parent material without any heat affected zone. Current research works limit the application of cold pressure welding mainly to Aluminium and Copper. In this research, an attempt is made to perform Cold pressure welding of Nickel Aluminium Bronze alloy which finds numerous marine application due to its excellent corrosion resistance. The microstructure and the mechanical properties of the joints are going to be investigated to study the ability of the process to produce quality Nickel Aluminium Bronze joints.

COMPLETED

- Literature survey & review.
- Sample preparation.
- Identifying research gap.

CURRENTLY

- Experimental procedures.
- Macro and micro structure analysis.
- Tensile and Micro hardness tests.
- Documentation of the outcomes.
- Preparation of manuscript.

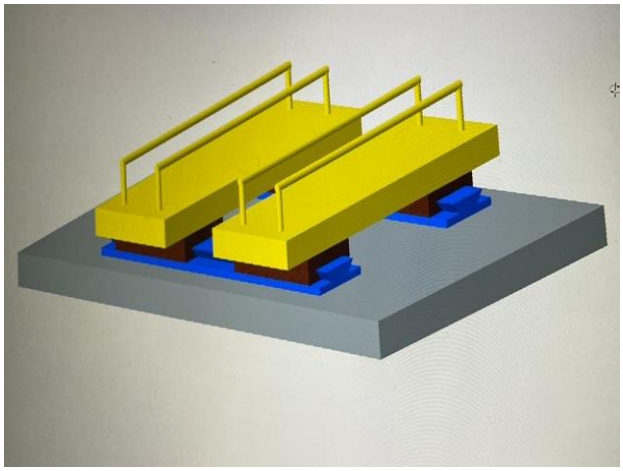
CHAPTER 2 – PROJECTS

1. Design And Fabrication of Cold Pressure Welding Machine

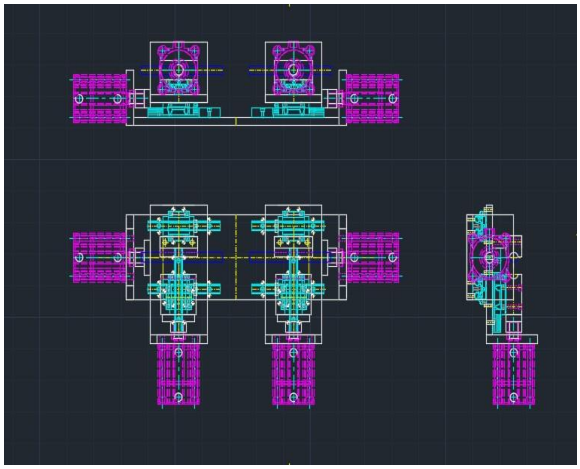
JAN'2022 – SEP'2022

DESIGN

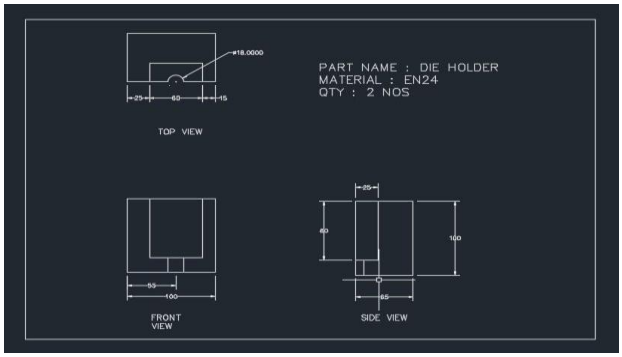
Three different CAD software were used for our designing purpose. AutoCAD, Creo and Catia were used to design all of the parts.

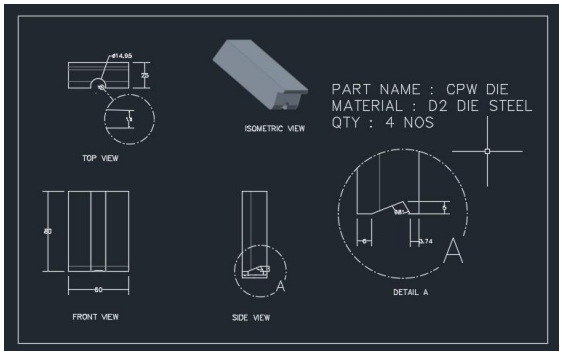


CONCEPT VISUALISATION

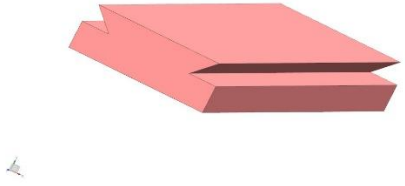


CYLINDER MOVEMENT VISUALISATION

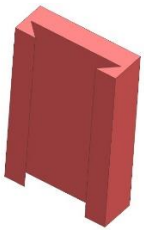




DIE AND DIE HOLDER DRAWING



DOVE TAIL MALE PART



DOVE TAIL DEMALE PART

1. Design And Fabrication of Cold Pressure Welding Machine
JAN'2022 – SEP'2022

FABRICATION:

Several operations and process were used to manufacture the desired parts for the machine including Heat treatment, CNC milling, grinding, Electrical Discharge Machining (EDM). A 50L hydraulic power pack provides the pressure with a 4/3 direction control valve, and a two-hp motor is used to control the cylinders.

DIE HOLDERS

DIE MATING SURGACE

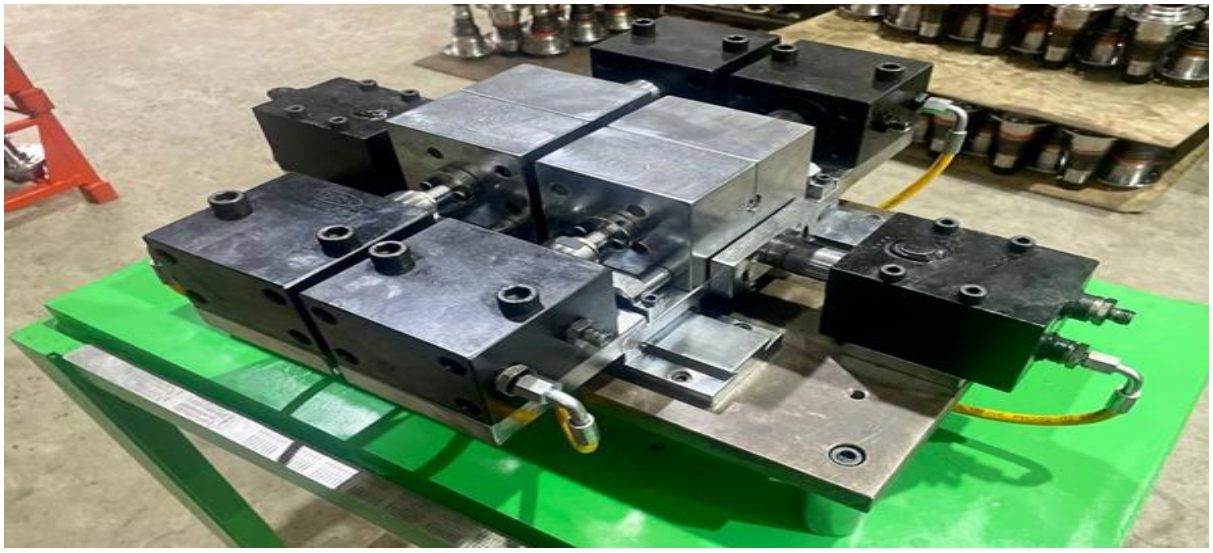
REDESIGNED AND FABRICATED DIE

DOVE TAIL MALE PART

DOVE TAIL FEMALE PART

HYDRAULIC CYCLINDERS

1. Design And Fabrication of Cold Pressure Welding Machine
JAN'2022 – SEP'2022



FULLY ASSEMBLED COLD PRESSURE WELDING MACHINE

HYDRAULIC POWER PACK

RESULTANT JOINT

WORKING VIDEO LINK: https://tinyurl.com/3sm9p5ww.

2. Hot Corrosion Resistance of Laser Powder Bed Fusion Based Additive Manufactured Ti-6Al-4V Titanium Alloy.

APR'2022 – PRESENT
INTERNALLY FUNDED PROJECT (BUDGET – 31,000 INR)

Additive Manufactured Ti-6Al-4V Alloy

Laser Powder Bed Fusion machine

OVERVIEW

The goal of this project is to investigate the hot corrosion resistance of titanium alloy manufactured using a laser powder bed fusion-based additive manufacturing process and the outcomes will be associated with the micro-structural properties of the generated samples.

COMPLETED

- Presented the proposal and received funding from the Dean of Research.
- Purchase of wrought titanium samples.
- Additive manufactured titanium samples.
- Macro and micro structure analysis using optical microscope.

CURRENTLY

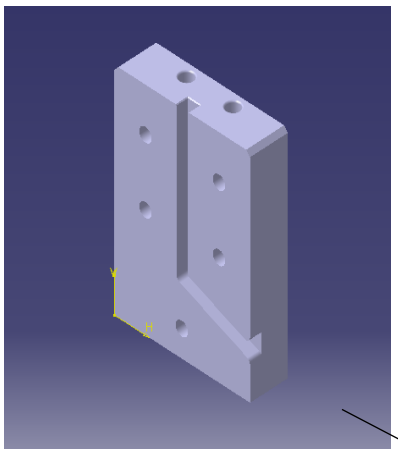
- Hot corrosion studies on additive manufactured titanium samples.
- Characterisation of samples.
- Documentation of the outcomes.
- Preparation of manuscript.

IFP PROPOSAL LINK: https://tiny.one/2p8n8pyu.

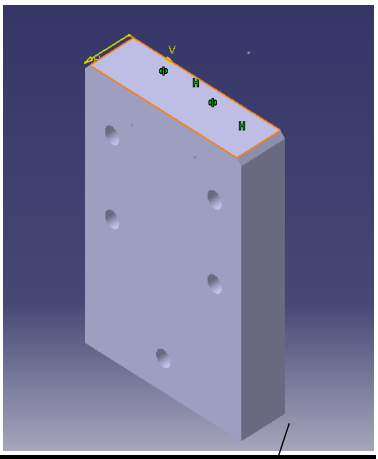
IFP PRESENTATION (PPT) LINK: https://tiny.one/y3ueuctk.

3. Functionality Of Equal-Channel Angular Pressing Die
OCT'2020 – NOV'2020

DESIGN

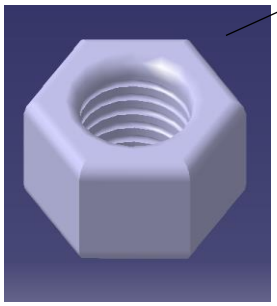


ECAP DIE 1

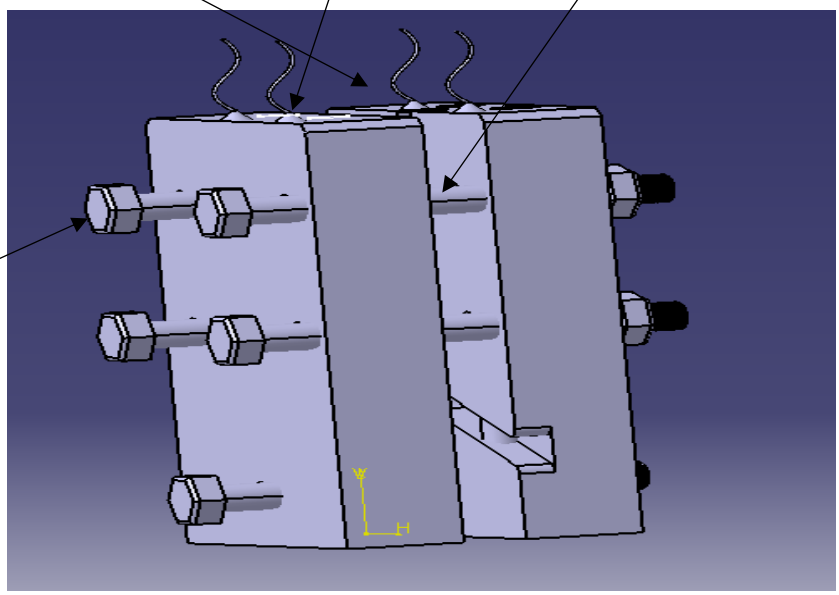


ECAP DIE 2

BOLT



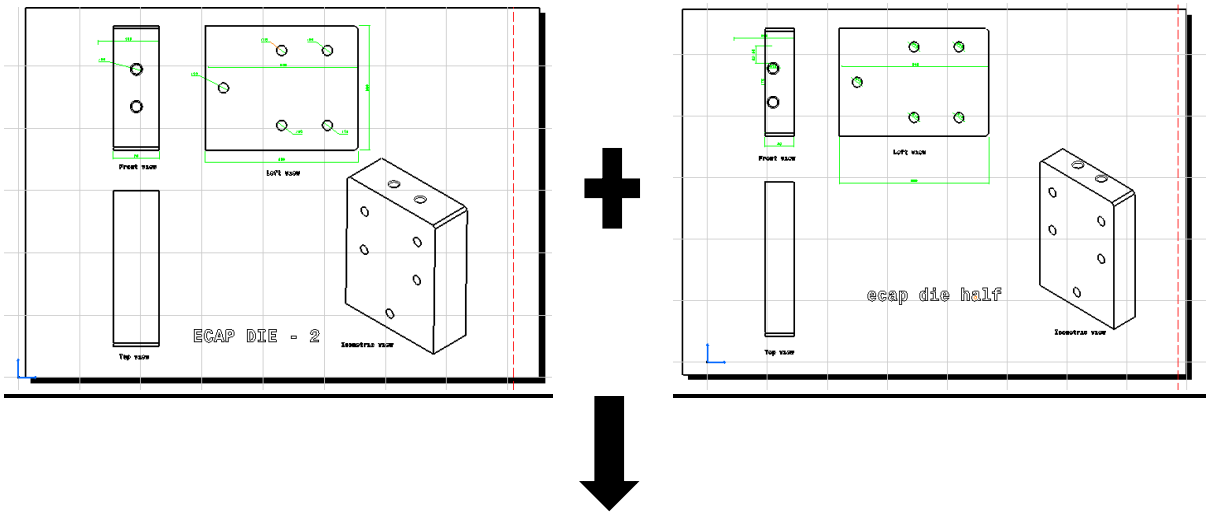
NUT



CAD MODEL OF ECAP

Description	ECAP
ECAP die material	EN-24
CAD Software	CATIA V5
Design time	~1.5 hour

FABRICATION:



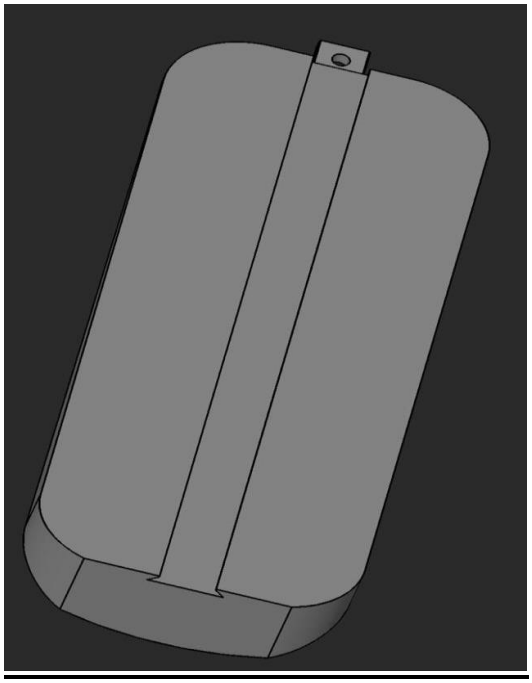
OUTCOMES

The fabricated ECAP die has a channel angle (θ) of 110 degrees and a curvature angle (Ψ) of 30 degrees. A valuable technique for creating materials with extremely fine grains is Equal-Channel Angular Pressing (ECAP). The sample's rotation along the billet's longitudinal axis and the repeated application of ECAP enable the use of various deformation pathways. The ECAP die is retained at our college's manufacturing lab for further research and study.

CHAPTER 3 – WORK EXPERIENCE

1. L&T Valves Limited , Coimbatore
OCT'2021 – DEC'2021
DESIGNATION: Manufacturing Engineer

DESIGN OF PLUG VALVE:



PLUG VALVE

Description	PLUG VALVE
ECAP die material	316L Stainless Steel
CAD Software	CATIA V5
Design time	~0.5 hour

CHAPTER 4 – EXTRA-CURRICULARS

1. TEACHING ASSITANT
JAN'2022 – MAY'2022
COURSE: Fundamentals of Mechanical Engineering and Practices Lab

OVERVIEW

I had the opportunity to be Dr. A.K. Laksminarayanan's teaching assistant for a newly introduced course, Fundamentals of Mechanical Engineering Lab, during my 6th semester. I assisted the professor in preparing the course's lab manual, course materials, and grade sheet. During this course, I Monitored 20 + students with their fabrication projects, which was part of the course requirements. I was also assigned to prepare activity sheets based on "gear pumps" and "directional control valves" for the students.

LINK FOR THE ACTIVITY SHEETS:

Gear pumps - https://tiny.one/3u5wnrv7.

Directional control valves - https://tinyurl.com/2p94w9u3.

MAJOR LEARNINGS

- Communication.
- Leadership.
- Lesson planning.
- Time management.
- Multidisciplinary experience.

2. YOUTH RED CROSS (YRC)
AUG'2019 – PRESENT
CORE COMMITTEE MEMBER

OVERVIEW:

- I initiated a vaccination camp during COVID-19 on campus.
- Additionally, I Participated in several camps, including blood donation, tree planting, and campus cleaning.
- I was involved in the design of posters and banners to raise awareness about broad societal issues.

Campus cleaning camp

Tree plantation camp

Vaccination camp

THANK YOU FOR YOUR VALUABLE TIME!

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