



Materials, Design & Manufacturing Facility (CWB)

材料、設計和製造中心（清水灣）

MDMF (CWB)

Introduction

05/Mar/2024

MDMF (CWB)

1





Our Services – 5 Units

CAD/CAM/CAE (CAD)

CAD/CAM/CAE Services
Materials, Design and Manufacturing Facility (CWB)



Materials Services (MAT)

MAT Services
Materials, Design and Manufacturing Facility (CWB)

DS Services
Materials, Design and Manufacturing Facility (CWB)

MATERIALS, DESIGN AND MANUFACTURING FACILITY (CWB)

EMF Services
Materials, Design and Manufacturing Facility (CWB)

Development Studio (DS)

Electrical & Mechanical Fabrication (EMF)

IMR Services
Materials, Design and Manufacturing Facility (CWB)

Instrumentation, Maintenance & Repair (IMR)





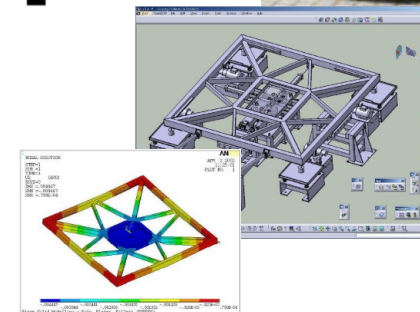
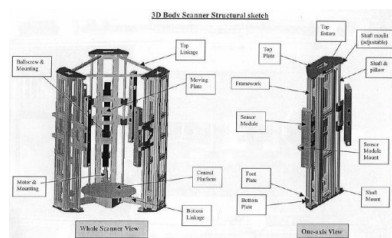
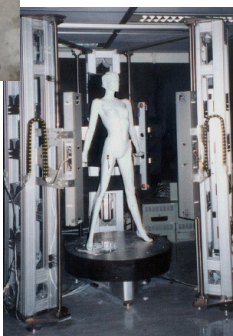
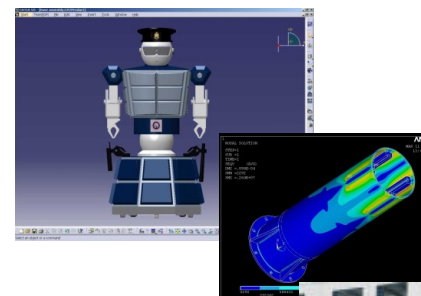
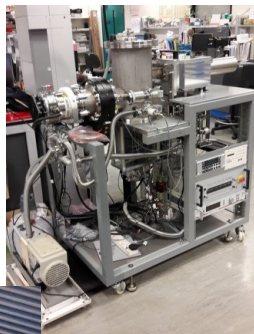
Services Scope – EMF

- Engineering design and fabrication supporting services
- Sophisticated mechanical & electrical parts/equipment for the university and industrial collaboration projects
 - Parts/equipment/controller is not available in market
 - Multidisciplinary and application oriented activities





Services Scope – EMF



05/Mar/2024

MDMF (CWB)

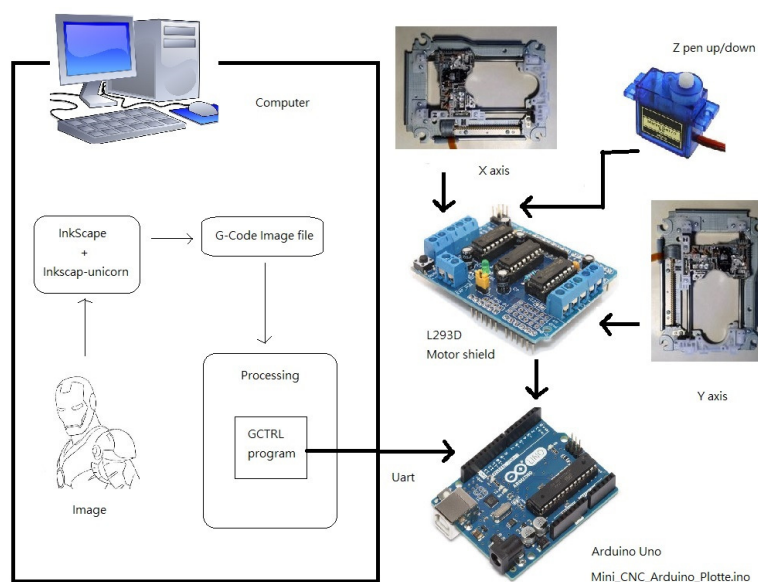
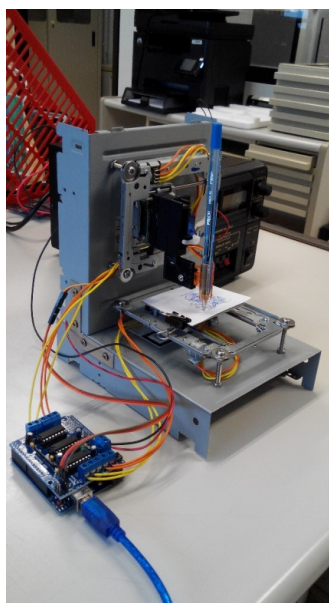
4





Services Scope – DS

- Controller design and fabrication supporting
 - Controller boards, MCUs, cam, motors, sensors (environmental, motion, light, etc.)
 - Eclipse for android development, Arduino IDE, Raspberry Pi, PLC
 - PCB prototyping



05/Mar/2024

MDMF (CWB)

5





Services Scope - IMR

- Repair and maintenance of equipment
 - Scientific instruments, computer control machineries, laboratory equipment, and electrical safety
 - Especially for those which are no longer supported by the manufacturers
- Calibrations for multimeter, power meter, data logger, radiation monitor and temperature sensors





Services Scope - IMR



05/Mar/2024

MDMF (CWB)

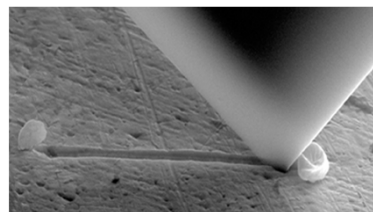
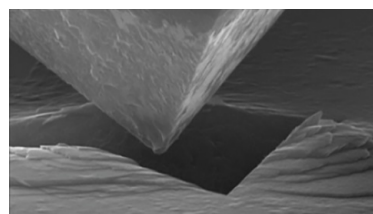
7



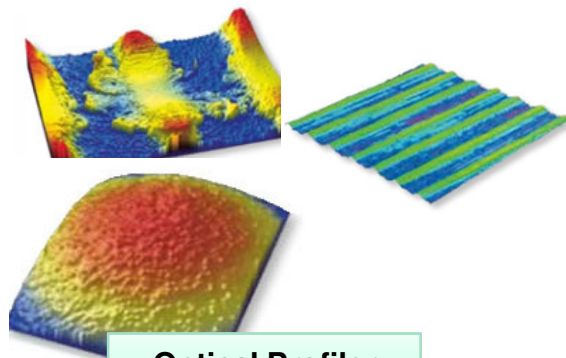
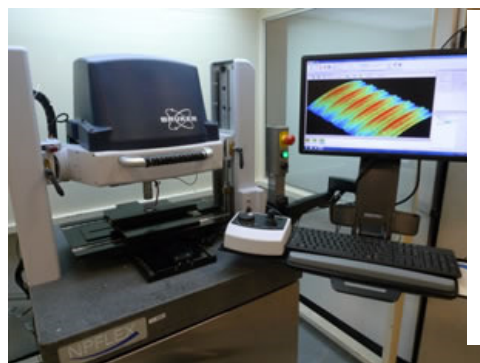


Services Scope - CAD

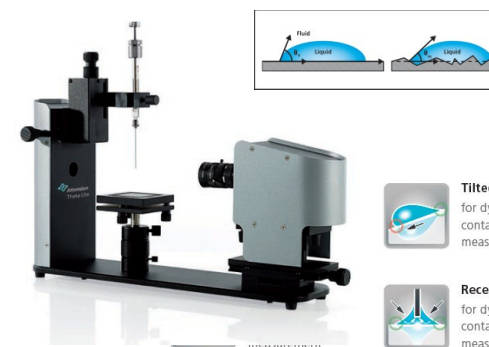
- Nano-measurement
 - Nano indenter, 3D surface metrology, optical profiler, contact angle meter



Nano Indenter



Optical Profiler




- Tilted drop***
for dynamic contact angle measurements
- Receding drop**
for dynamic contact angle measurement
- Meniscus**
for static contact angle measurement with a fiber/rod
- Captive bubble**
for static contact angle measurement of a gas bubble
- Pendant drop**
for surface and interfacial tension
- Reverse pendant drop**
for surface and interfacial tension
- Pulsating drop***
for dilational interfacial rheology measurement
- 3D Topography***
for roughness corrected contact angle
- Batch sessile drop**

Contact Angle Meter





Services Scope - CAD

- Metal, Nylon & Plastics - 3D printing, Laser cutting



Metal 3D Printer



Nylon 3D Printer



Plastics 3D Printer – Filaments FDM



Plastics 3D Printer – Resin SLA



Metal & Plastics Laser Cutting

05/Mar/2024

MDMF (CWB)

9





Services Scope - CAD

- CAD/CAM/CAE system support, 5-axis metrology, 3D scanning, reverse engineering



CAD/CAM/CAE Support



5-Axis Metrology



3D Scanning & Reverse Engineering

05/Mar/2024

MDMF (CWB)

10





Services Scope - MAT

- Mechanical Testing
 - also known as destructive testing, reveals the properties of a material under dynamic or static force



MTS 810
5KN to 100KN



MTS 858
15kN Axial and 100 Nm Torsion



MTS 858 Mini Bionix
25KN Axial, 250 Nm Torsional

05/Mar/2024

MDMF (CWB)

11





Services Scope - MAT

- Inspection and Failure Analysis
 - determining the root cause of parts/assembly failure and working out the means for correcting and preventing current/future problems



X Ray inspection system: GE
Detail Detectability : up to $0.2\mu\text{m}$
Max. Voxel Resolution : $< 1\mu\text{m}$
Max. Object Size : 680mm x 635mm



X Ray with CT imaging inspection system:
yxlon Cougar EVO
Detail Detectability : $< 0.75\mu\text{m}$
Spatial Resolution : $1.5\mu\text{m}$
Max. Object Size : 440mm x 540mm





Services Scope - MAT

- Inspection and Failure Analysis
 - determining the root cause of parts/assembly failure and working out the means for correcting and preventing current/future problems



**Zeta Potential / Nano-particle Analyzer:
ZetaPlus**
Zeta Potential Range : -150 to + 150 mV
Size Range : 10nm to30µm



TecScan 7 Axis Immersion Scanner
1600mm x 800mm x 800mm sample length



C-SAM: Sonix Quantum 350H
Spatial resolution:0.5 µm
Depth resolution: 8 µm

05/Mar/2024

MDMF (CWB)

13





Services Scope - MAT

- Inspection and Failure Analysis
 - determining the root cause of parts/assembly failure and working out the means for correcting and preventing current/future problems



Particle Size Analyzer
Measurement capability
from 0.01 to 2800 microns



Microscope: Topcon TMM-130Z
Measuring range: 130 x 130 x 50 mm
Minimum indication: 0.001 mm
Accuracy: $(3 + 2.5L/100) \mu\text{m}$

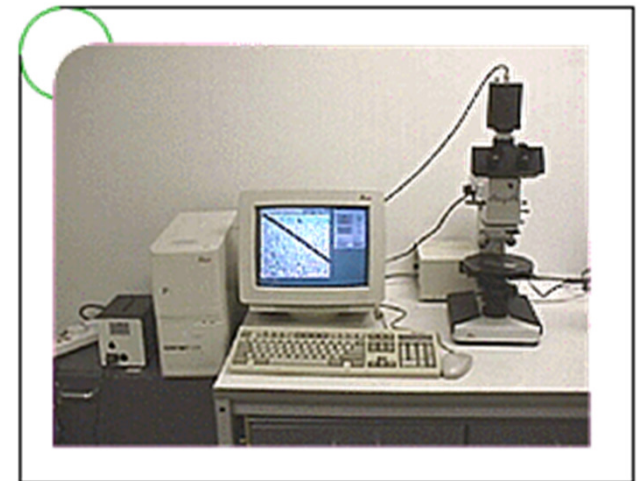


Image Processing System
Leica QUANTIMET 500+





Services Scope - MAT

- Sample Processing
 - processing of metal heat treatment, polymer and carbon composite

Reactive Ion Etching System



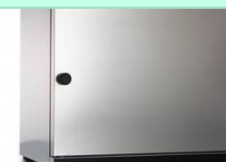
Ultracut &
Ultramicrotome and EM
FCR

Centrifuge Z 326

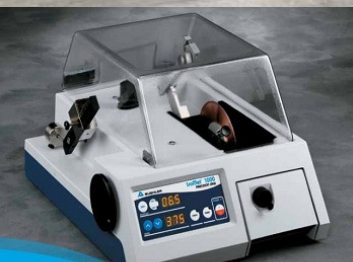


Autoclave

Oven: Heating
and Drying



Furnace



Diamond Precision Saw

05/Mar/2024



Misonix XL2020
Sonicator



Hot Melt Prepregger

MDMF (CWB)



Hydraulic Hot Press



Humidity Chamber

15

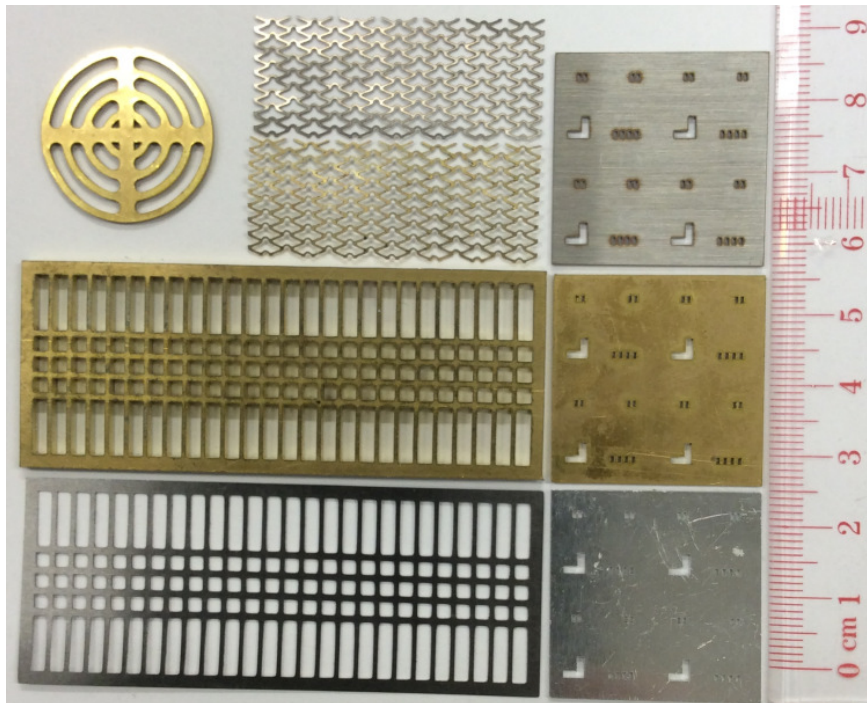




Project – Metal Laser Cutting

- Fiber laser cutting machine of 1.5kW
 - Working area: 630 x 530 x 90 mm
 - 4th rotary axis for round pipe cutting

Mild Steel (mm)	0.2 ~ 16
Stainless Steel (mm)	0.2 ~ 8
Aluminum (mm)	0.5 ~ 5
Copper (mm)	0.5 ~ 2
Brass (mm)	0.5 ~ 4



05/Mar/2024

MDMF (CWB)

16





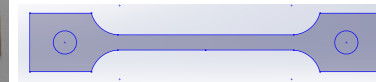
Project – Metal Laser Cutting

- Examples

- SMA specimens

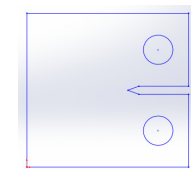
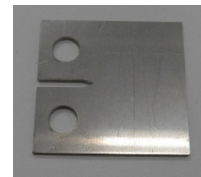
- Tensile specimen:

- Materials / Thickness: 1mm
 - Production time: 45 second



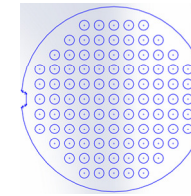
- Crack specimen:

- Materials / Thickness: 1.5mm
 - Production time: 1 min.



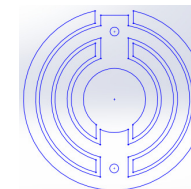
- S.S. Filter specimen

- Materials / Thickness: 1.2mm
 - Production time: 8min. 30 second



- Ti Electrode specimen

- Materials / Thickness: 1mm
 - Production time: 2min.





Project – Laser Marking & Engraving

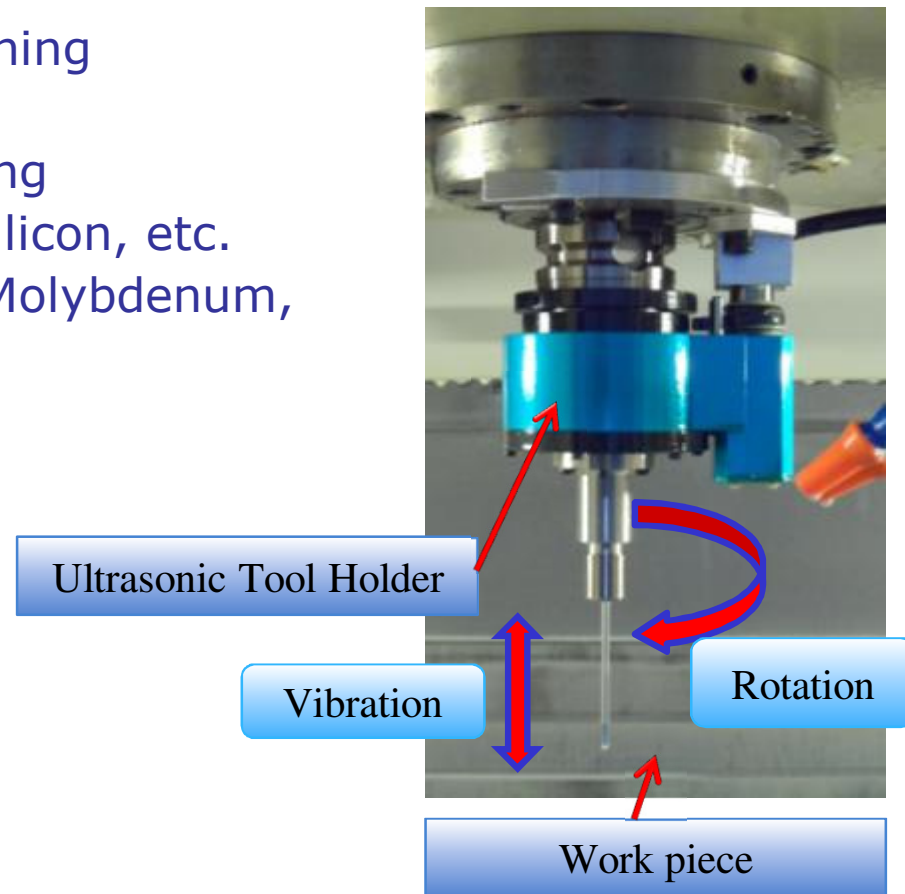
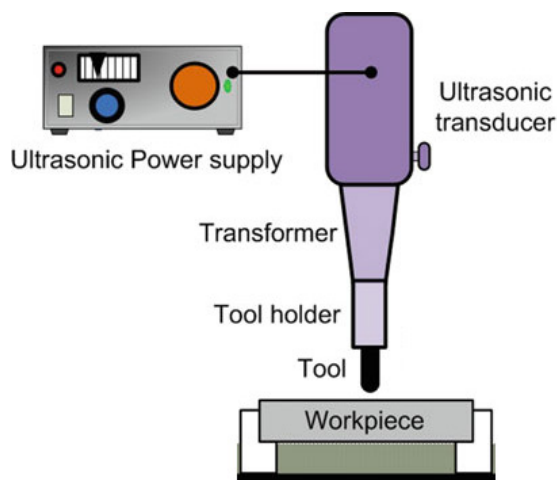
- Laser Marking Machine
 - 10W fiber laser
 - Max. size is 110mm X 110mm





Project – Ultrasonic-Assisted Machining

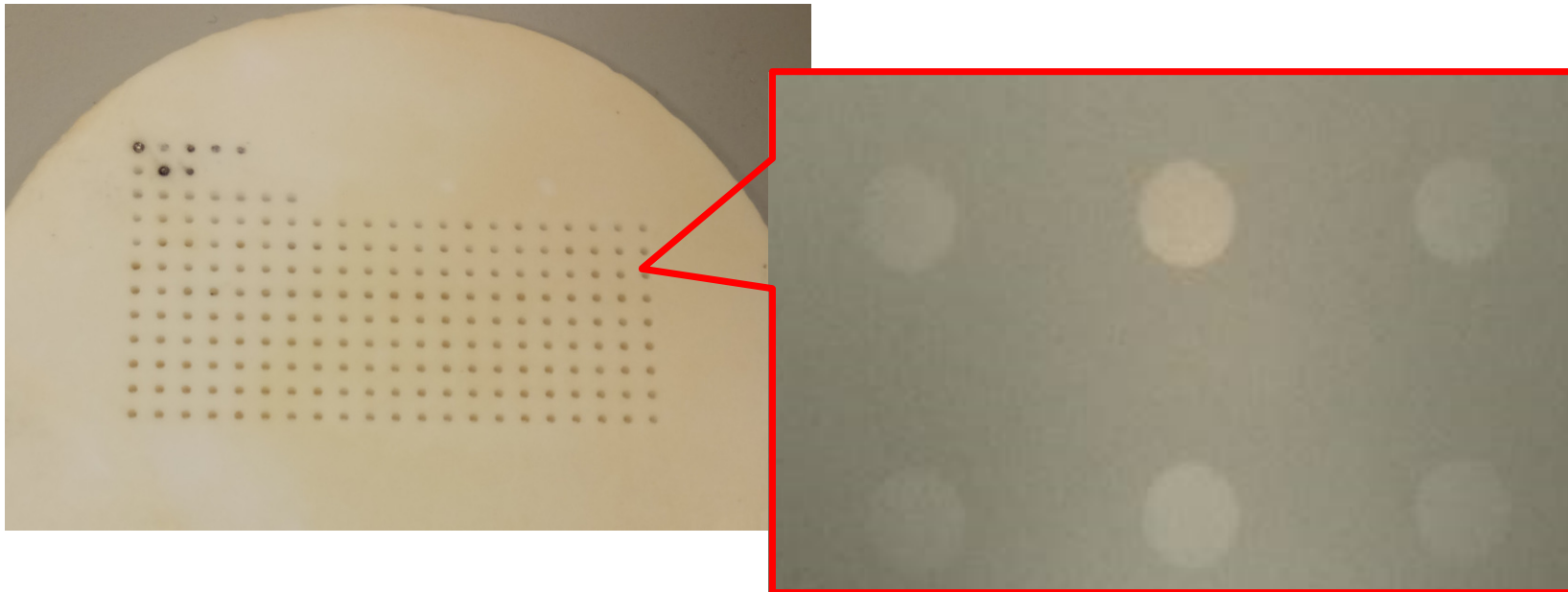
- Ultrasonic tool holder
 - Fast, small and deep hole machining
 - Length / Diameter > 10
 - Hard or ultra-hard material cutting
 - Glass, Ceramics, Vulcanization silicon, etc.
 - Stainless steel, Tungsten steel, Molybdenum, etc.





Project – Ultrasonic-Assisted Machining

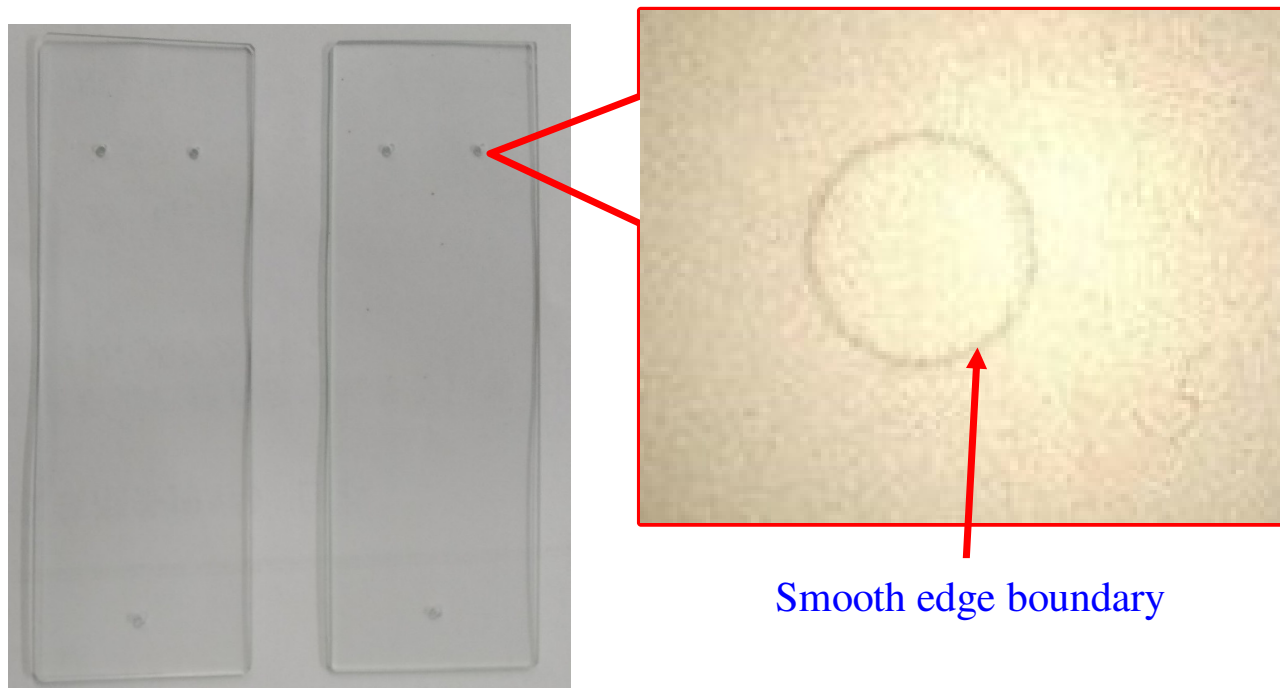
- Examples
 - Alumina, Small hole drilling / milling (blind hole)
 - Hole diameter = 1.2mm; depth = 1.4mm
 - # of holes to be drilled per workpiece = 400





Project – Ultrasonic-Assisted Machining

- Examples
 - Glass, Small hole drilling (thru' hole)
 - Hole diameter = 0.6mm; Glass plate thickness = 1mm
 - # of holes to be drilled per workpiece = 4



05/Mar/2024

MDMF (CWB)

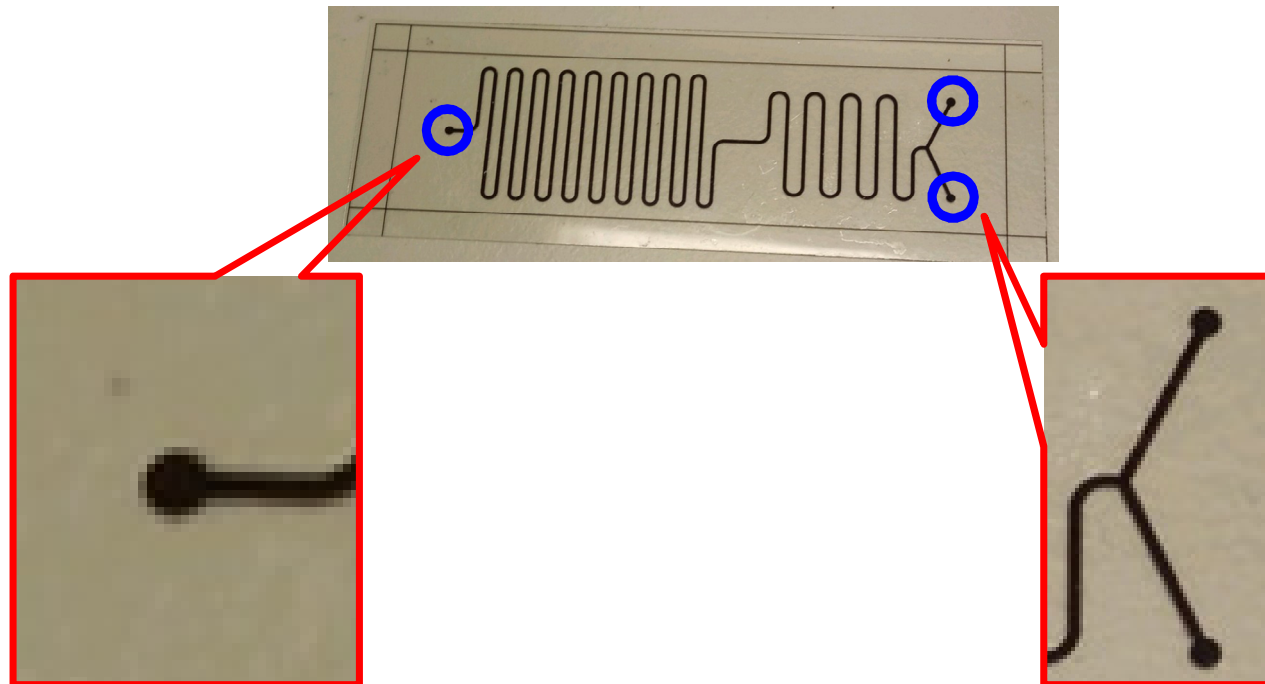
21





Project – Ultrasonic-Assisted Machining

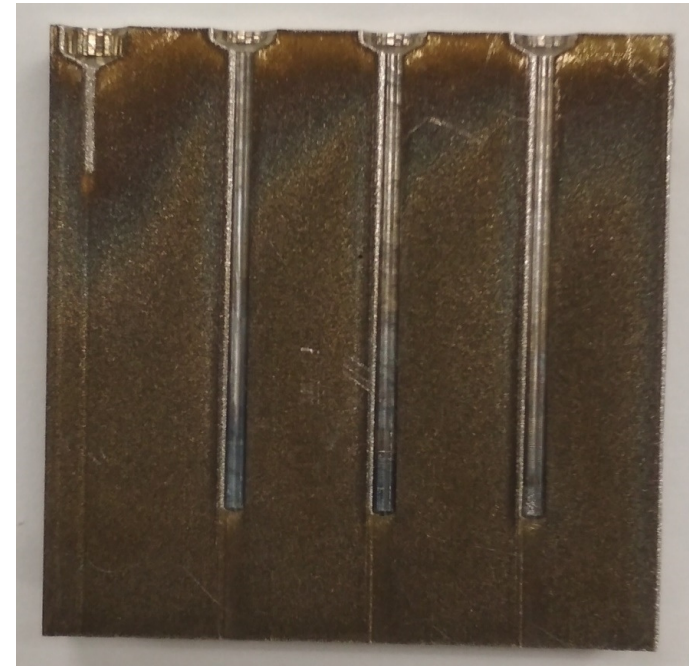
- Examples
 - Glass channel, Small hole drilling (thru' hole)
 - Hole diameter = 1.0mm; depth = 1mm
 - # of holes to be drilled per workpiece = 3





Project – Ultrasonic-Assisted Machining

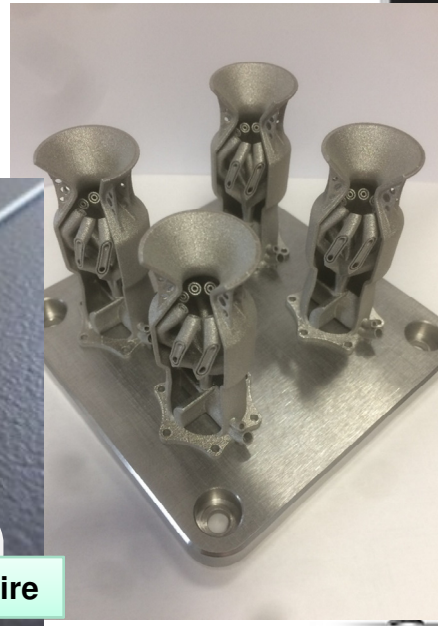
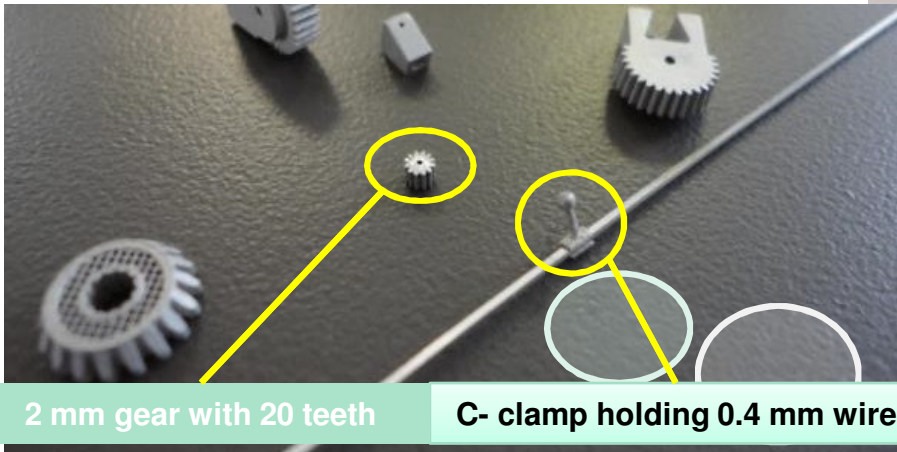
- Examples
 - Stainless steel, Small hole drilling (blind hole)
 - Hole diameter = 0.2mm and 0.9mm
 - Depth = 5mm and 20mm
 - SMA Shape Memory Alloy, Small hole drilling (thru' hole)
 - Hole diameter = 0.075m
 - Thickness = 2mm





Project – Metal 3d Printing

- Metal 3D printer – DMP Flex100
 - Build volume 100 x 100 x 80 mm
 - Layer thickness: 10 ~ 100 μm
 - Typical accuracy: $\pm 0.1\text{-}0.2\%$ with $\pm 50 \mu\text{m}$ minimum
 - Supported materials:
 - LaserForm 316L (B)
 - LaserForm 17-4PH (B)
 - LaserForm CoCr (B)



05/Mar/2024

MDMF (CWB)

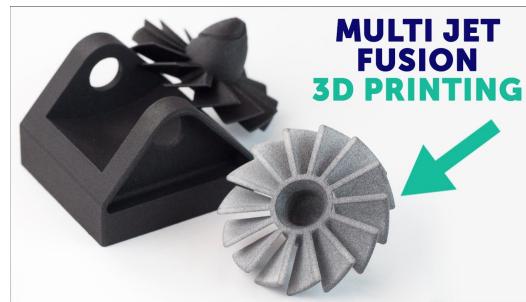
24





Project – Nylon 3d Printing

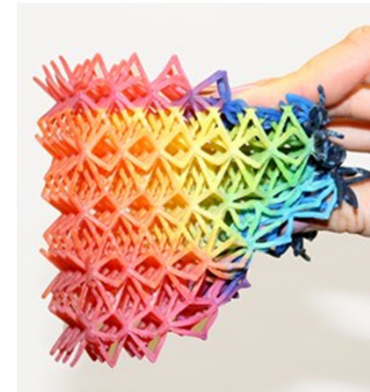
- Nylon 3D printer – HP Jet Fusion 540
 - Build volume 332 x 190 x 248 mm
 - Layer thickness: 0.08 mm
 - Typical accuracy: $\pm 0.3\%$ with ± 0.2 mm minimum
 - Supported materials:
 - Nylon PA12





Project – Industrial SLA 3d Printing

- Industrial SLA 3D printer – J850 PRIME
 - Build volume 490 x 390 x 200 mm
 - Layer Thickness : down to 14 μm
 - File Formats for Printing :
 - Color and Texture: 3MF / OBJ / SolidWorks / VRML
 - Color: CATIA / Creo / Inventor / IGES / JT / Parasolid / NX / SolidEdge / STEP
 - None: STL
 - Accuracy :
 - Under 100 mm – $\pm 100\mu$
 - Above 100 mm – $\pm 200\mu$ or $\pm 0.06\%$ of part length, whichever is greater
 - Digital model materials: Unlimited number of composite materials including:
 - Over 600,000 colors with VeroUltra
 - Rubber-like materials in a variety of Shore A values
 - Translucent color tints





Project – Desktop SLA 3d Printing

- Desktop SLA 3D printer – Form 2
 - Build volume 145 x 145 x 175 mm
 - Layer Thickness 0.025 - 0.1 mm
 - File Formats for Printing: STL, OBJ
 - Professional print quality



05/Mar/2024

MDMF (CWB)

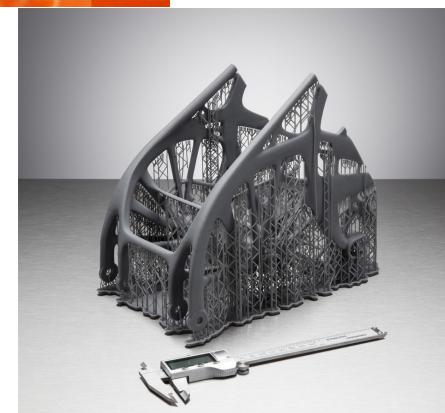
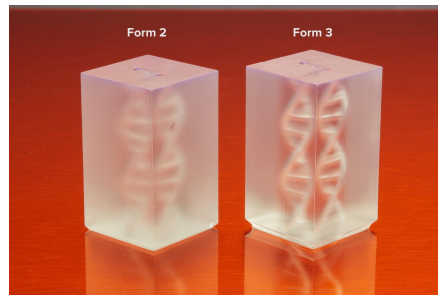
27





Project – Desktop SLA 3d Printing

- Desktop SLA 3D printer – Form 3L
 - Build volume 335 x 200 x 300 mm
 - Layer Thickness 0.025 - 0.3 mm
 - File Formats for Printing: STL, OBJ
 - Low Force Stereolithography (LFS)™



05/Mar/2024

MDMF (CWB)

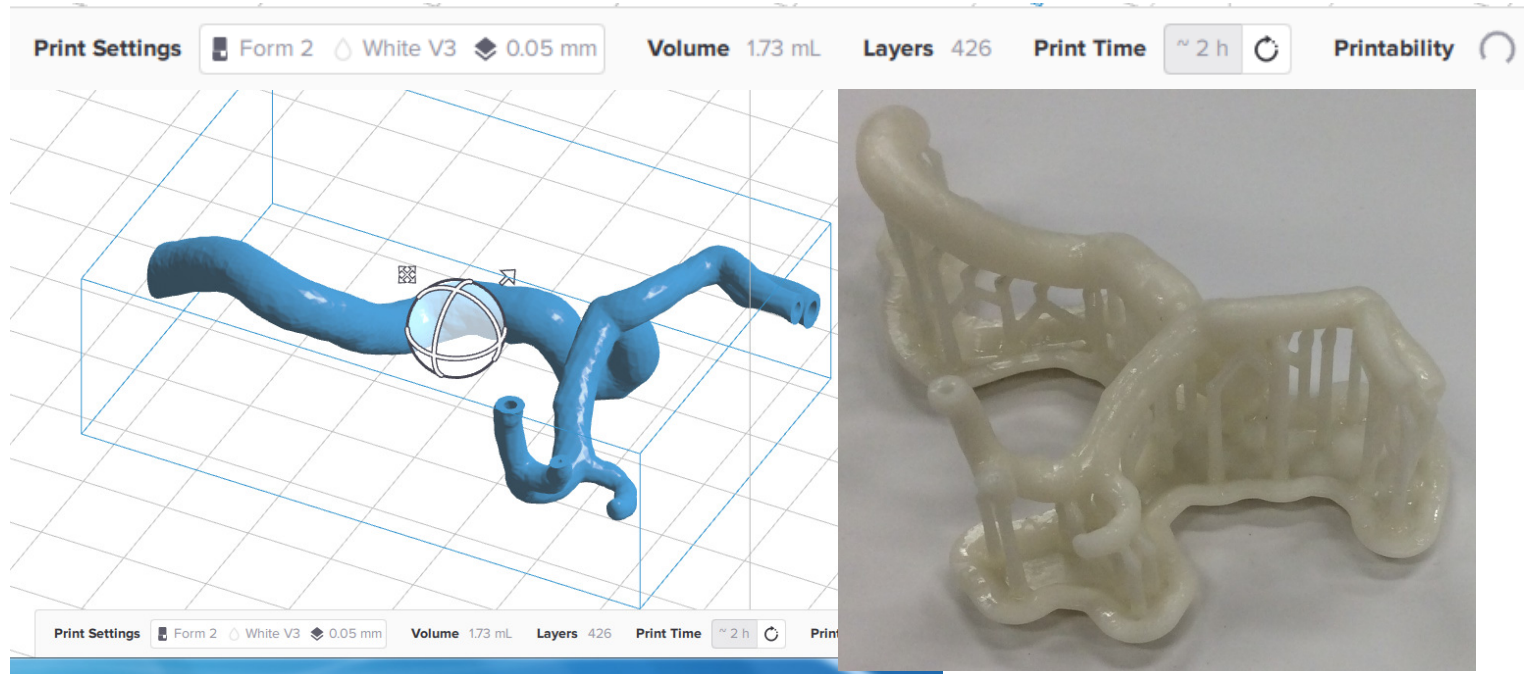
28





Project – Desktop SLA 3d Printing

- Examples
 - Blood vessel
 - Materials – Standard White
 - Minimum feature size = 0.5mm



05/Mar/2024

MDMF (CWB)

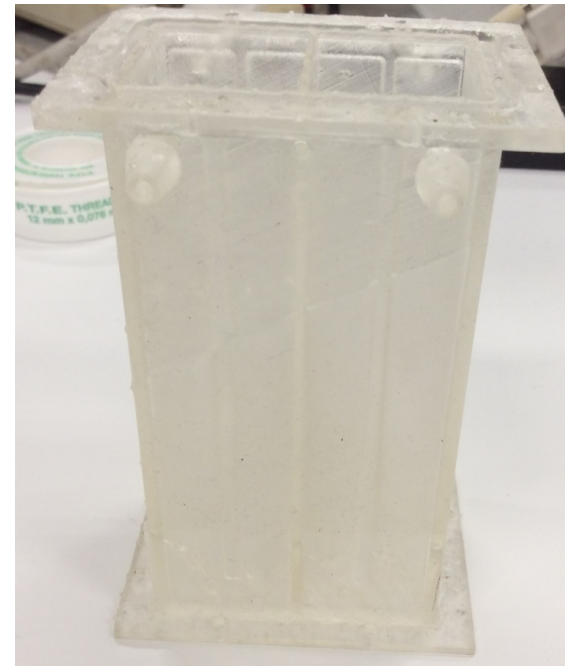
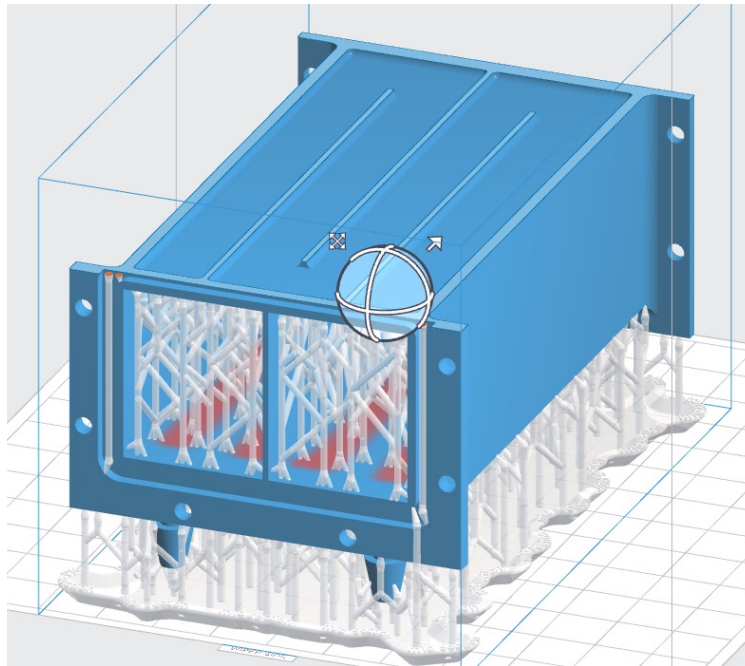
29





Project – Desktop SLA 3d Printing

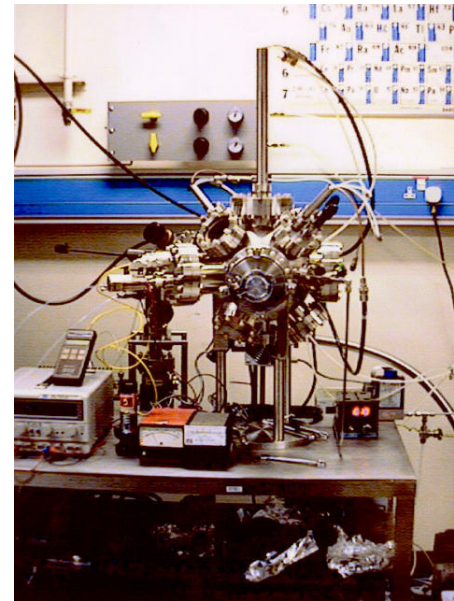
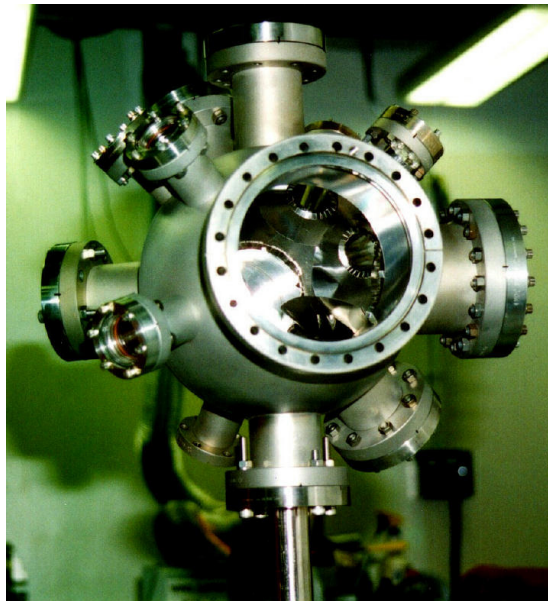
- Water channel model
 - Materials – Standard Clear
 - Channel size = 2.5mm
 - Internal water circulation





Project – High Vacuum Chamber

- High vacuum stainless steel chamber
 - Design and build an enhanced HVC with tailor made functionalities
 - Vacuum level less than 10^{-8} torr



05/Mar/2024

MDMF (CWB)

31





Project – Reactive Ion Etcher

- Design and build the reactive ion etcher in wafer fabrication
 - Tailor made functionalities



05/Mar/2024

MDMF (CWB)

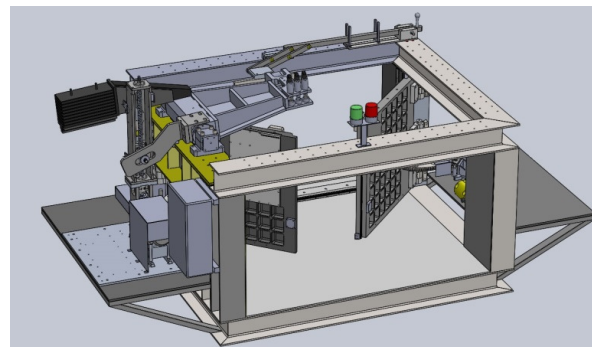
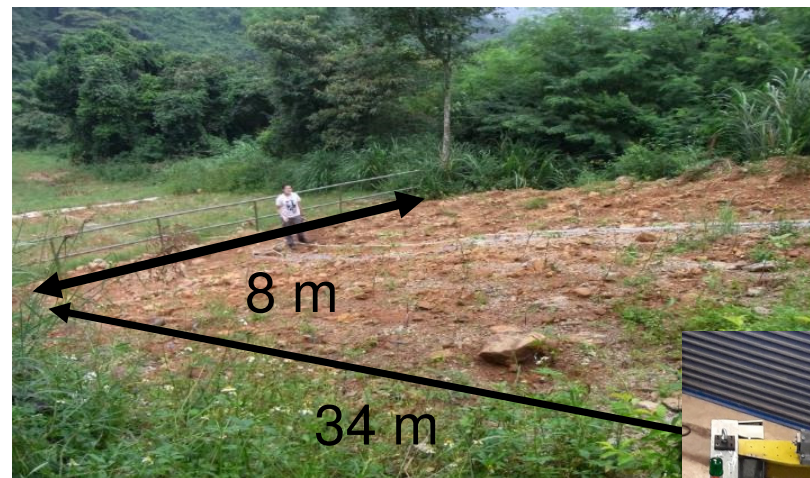
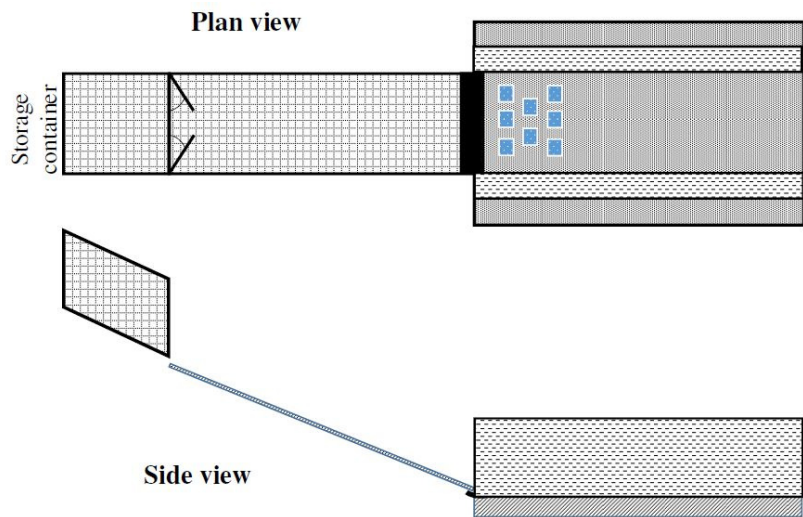
32





Project – Soil Retaining Gate

- Design and build the soil retaining gate of a flume model



05/Mar/2024

MDMF (CWB)

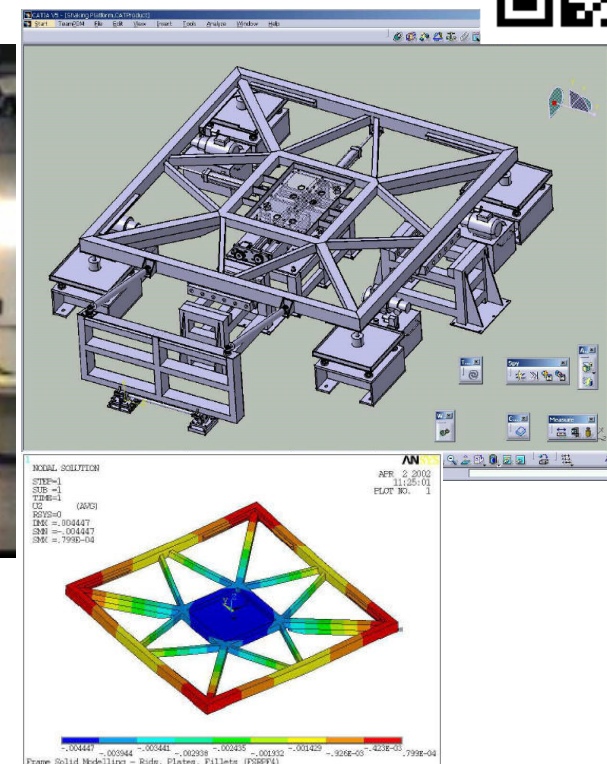
33





Project – Shaking Platform

- Design and build the shaking platform for
 - Active vibration control of earthquake / wind excited structures
 - Assessment of motion acceptance criteria for human occupancy in the design of flexible structures



05/Mar/2024

MDMF (CWB)

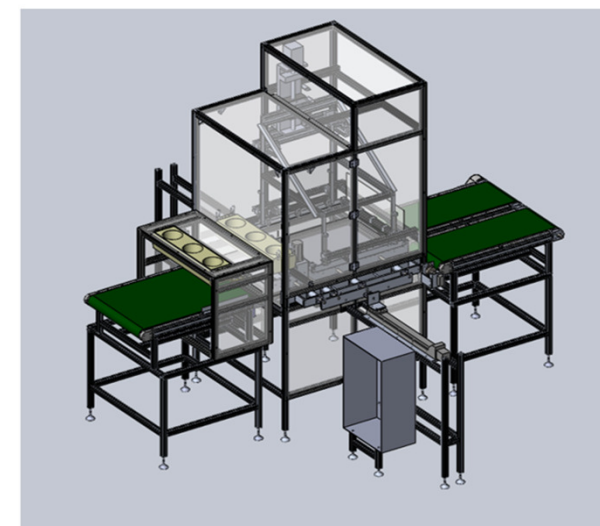
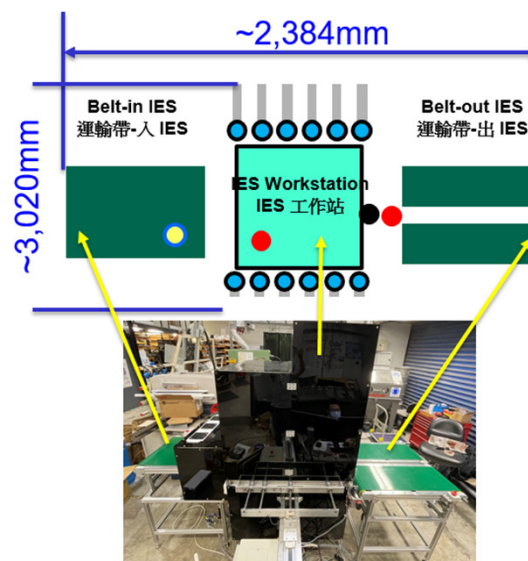
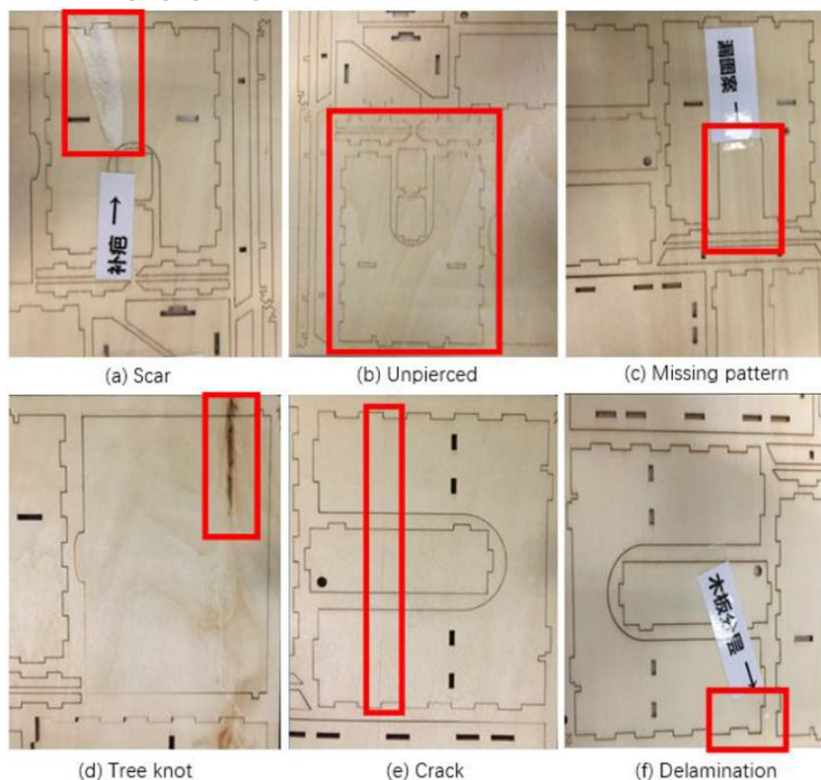
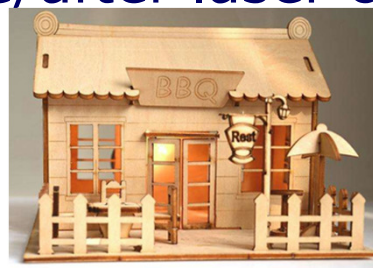
34





Project – Automatic Flaws Inspection System

- To automate the detection process of natural and manufacturing flaws before/after laser cutting a plywood board.



05/Mar/2024

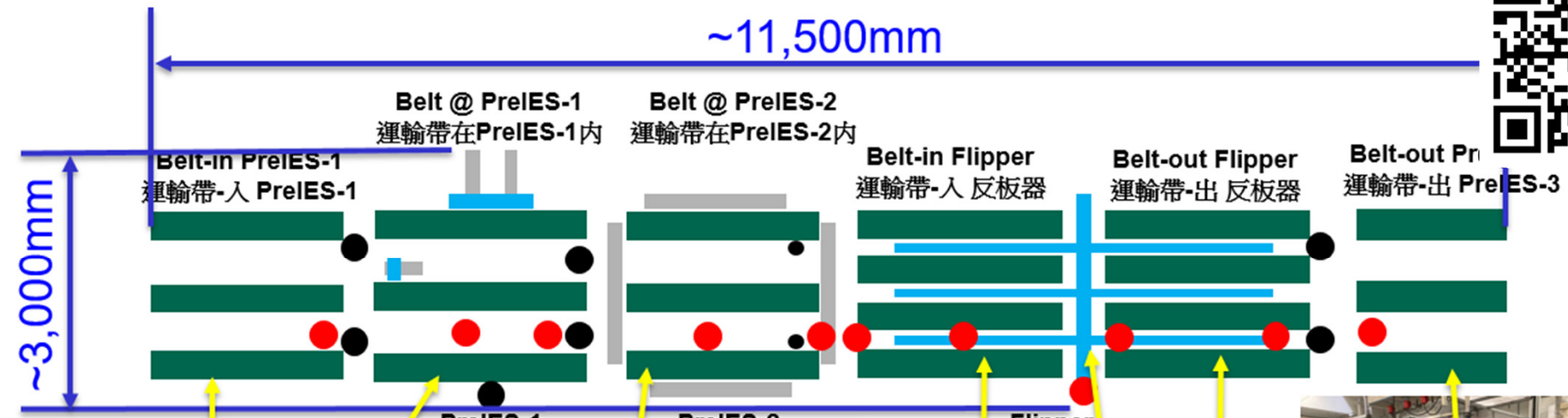
MDMF (CWB)

35





Project – Automatic Flaws Inspection System



PreIES-1 Workstation
PreIES-1 工作站



PreIES-2 Workstation
PreIES-2 工作站



Flipper
反板器



05/Mar/2024

MDMF (CWB)

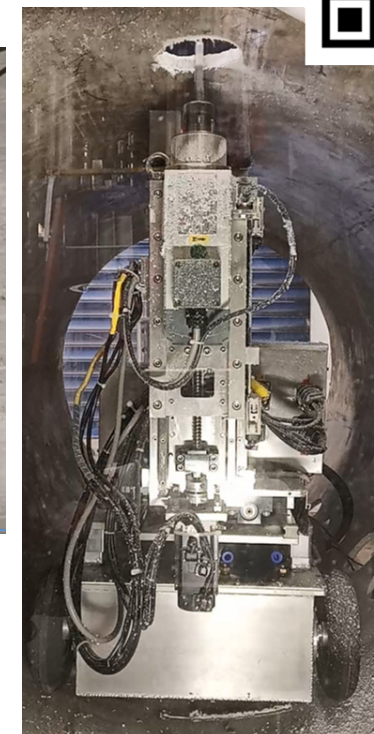
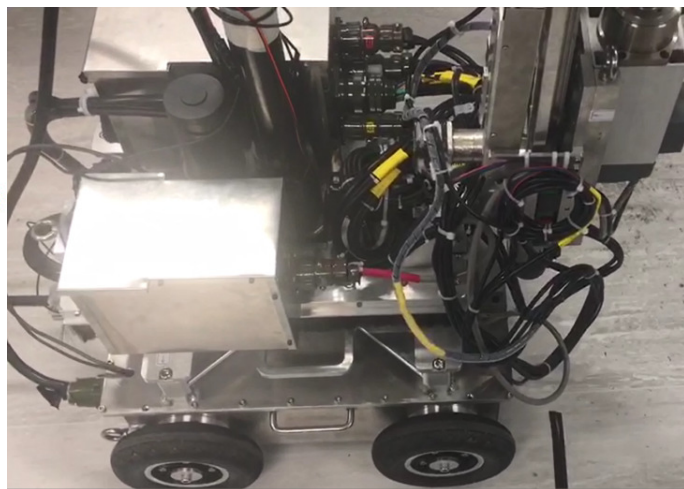
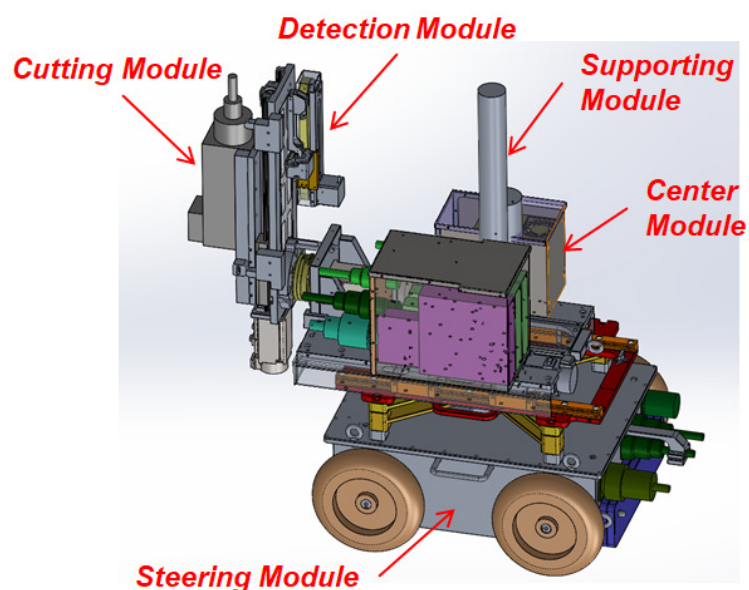
36





Project – CIPP Repair Robot Cutter

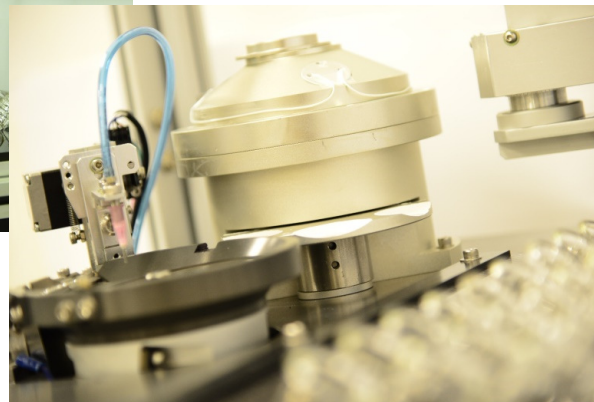
- To develop an automatic robot cutter that can cut the lateral connection branch opening during underground drainage pipe repairing in Hong Kong.





Project – Diamond Sorter

- An automation system to sort gems into different size / color / shape / transparency grades and to measure the cutting / cracks on diamonds
 - Involves the R&D of a vision system, image processing module and an electromechanical mechanism



05/Mar/2024

MDMF (CWB)

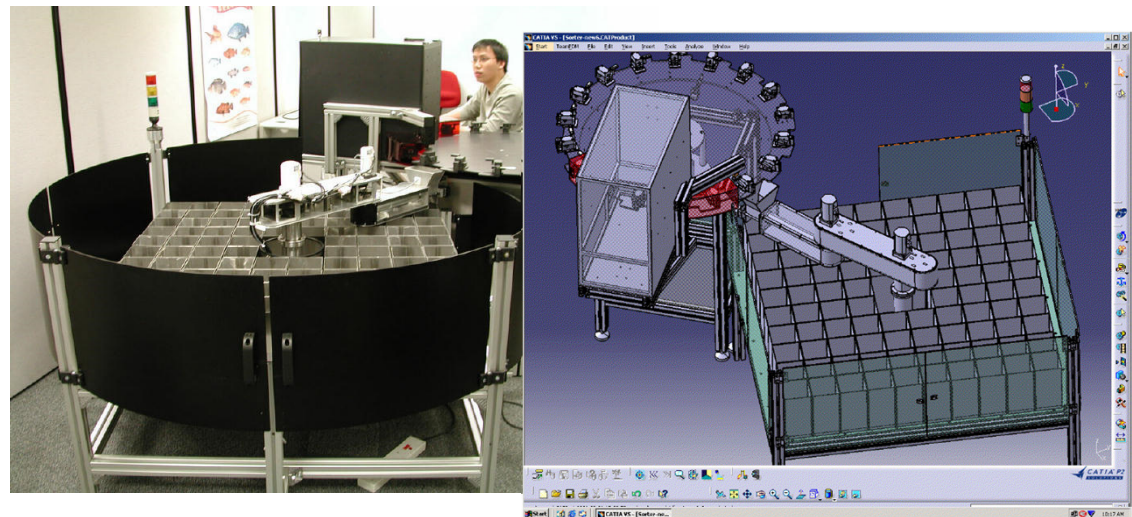
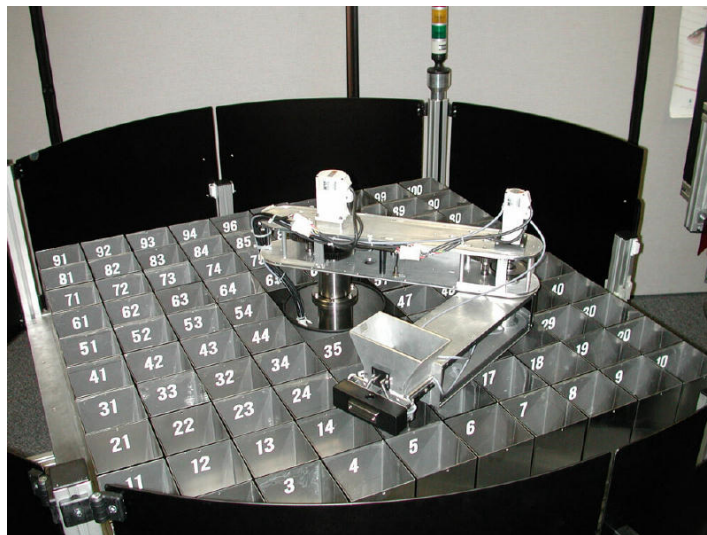
38





Project – Feather Sorter

- To sort feathers of different features for the shuttlecock manufacturing industry.
 - Involves the R&D of a turning table, an image processing system and a robotic arm, which selects feather into the bin matrix according to their degree of curvature



05/Mar/2024

MDMF (CWB)

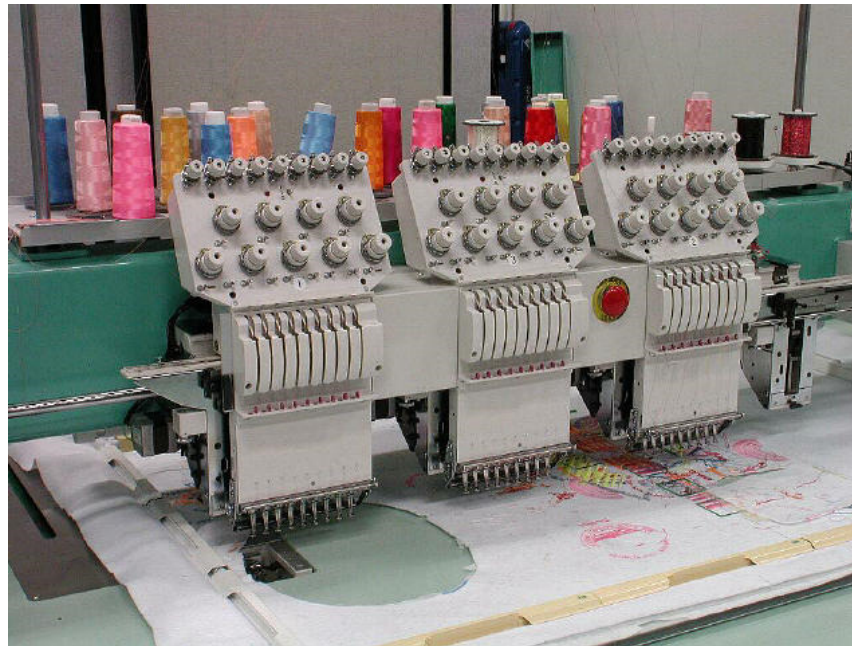
39





Project – Controller for Embroidery Machine

- Design and develop a controller to control the embroidery machine more precisely and at higher speed, with less vibration
 - Linux in an embedded system, with advanced control algorithms for accurate positioning, tension control, automatic compensation of vibration



05/Mar/2024

MDMF (CWB)

40





Engineering / Robotic Design Competition

- RoboCon
- ROV
- Cybathlon
- Pedal Kart
- Power Bike
- ...



05/Mar/2024

MDMF (CWB)

41

