

Rapid Casting Prototype Modeling and Development Case study

This project done by:

Sulaiman Alhusayni	426103221
Malek Al Mazroua	427104129
Yossef Al Otham	427106123

Supervisor:

Dr. Ali Alsamhan

Rapid prototype definition

- The rapid prototype(RP) is important technique in development and introducing new innovated products for industries and public.
- Prototype is commonly used to test the functionality and efficiency of the product before going to actual production line.
- RP classification : Direct , Indirect, Semi-direct

Rapid prototype definition

- Direct tooling involves use of RP models themselves as patterns and core boxes for sand casting application.
- Indirect tooling makes use of RP models as intermediate masters for producing final patterns and core boxes.
- Semi-direct tooling involves the use of RP systems to make dies for producing wax patterns for investment casting.

Project Objectives

- RP technique is monopolized by modern industrial countries. Hence, the main objectives from the current project are transferring this type of technology to Saudi Arabian industries.
- In this project rapid casting prototype technique (direct method) will be applied to manufacturing a selected casting from a developed local product.

Project objectives

- It is decided to select casting from a local water pump manufacture, which is **pump-motor support** casting. [Alsamhan Factory for Saudi Pump Co., Ltd]

Motor sub-assembly

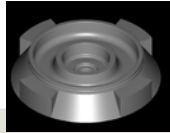
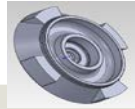


Pump-motor sub-assembly

Assembly line for pump-motor support

Pump-motor support

Project Roadmap



1
3D Solid model generation from the given 2D drawing

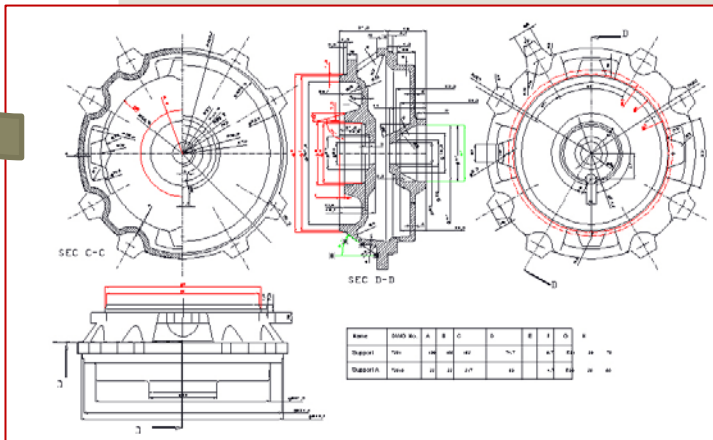
2
3D solid model of support master patterns

CAM 3
system for support pattern and master core pattern

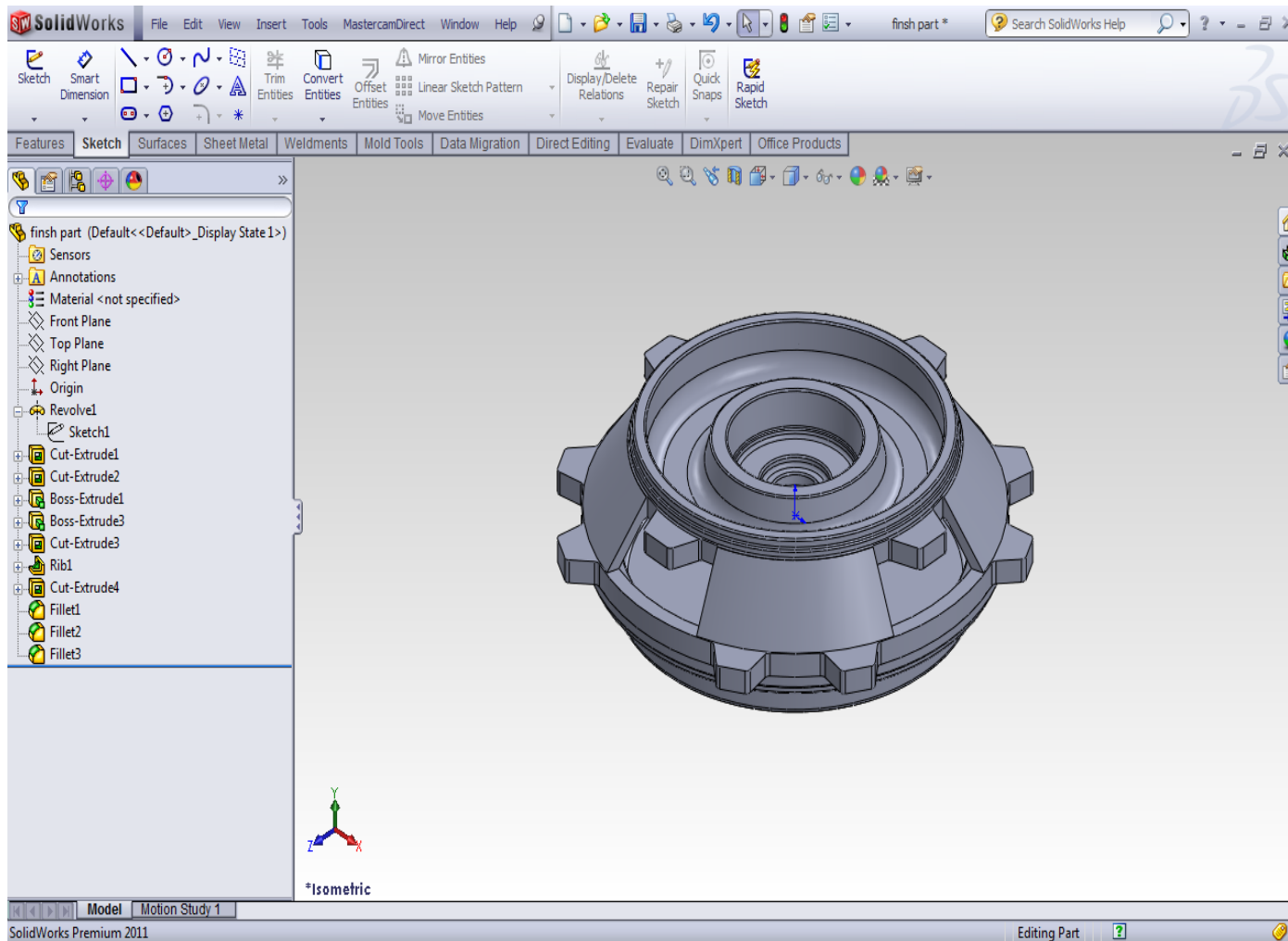
4
G-code program and CNC machining

5
Develop resin core box

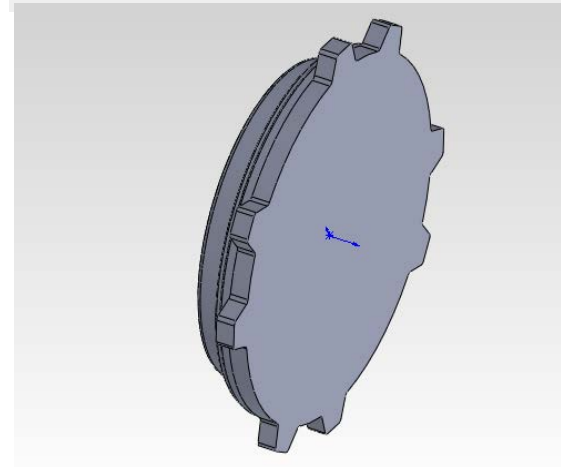
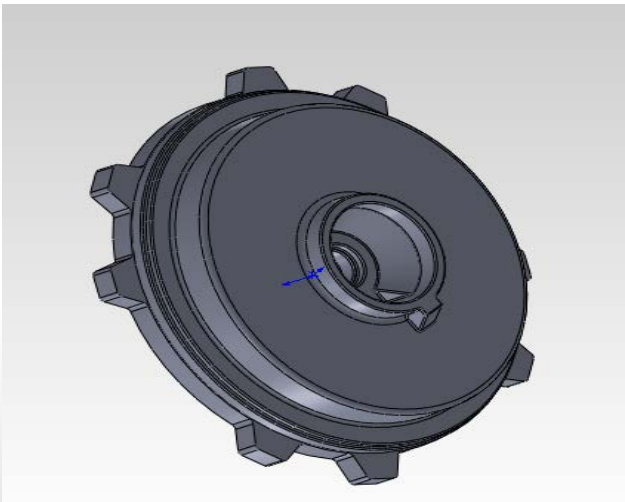
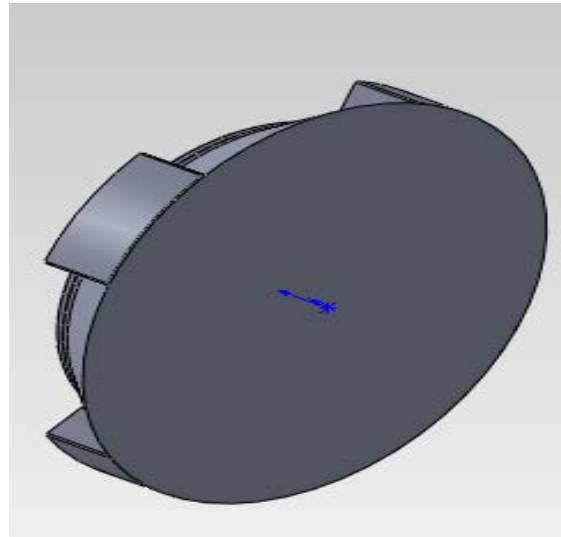
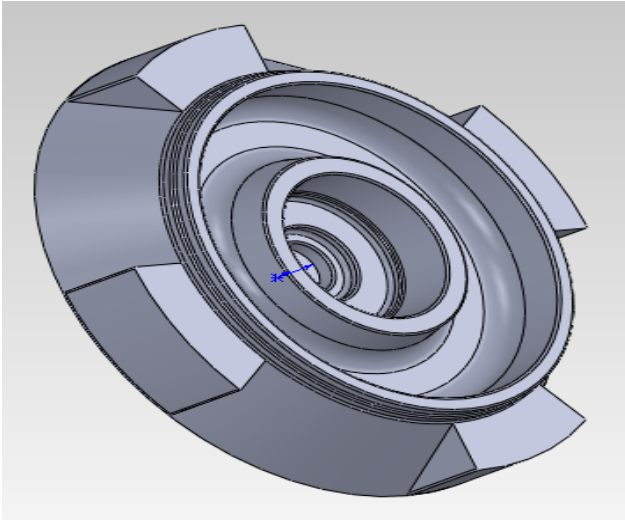
6
Sand molding and casting process



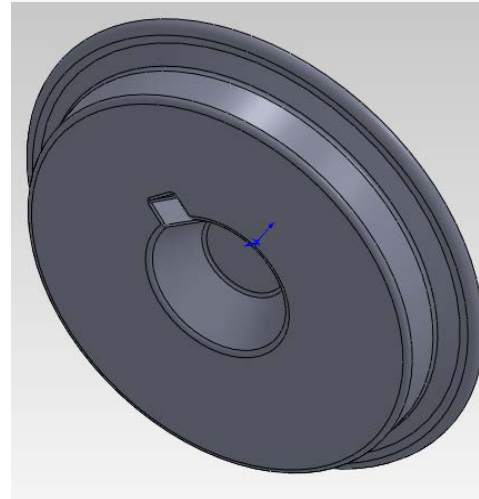
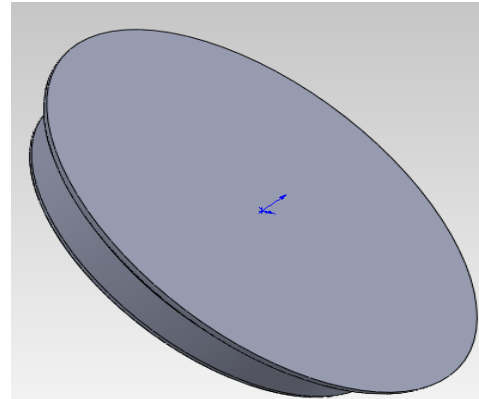
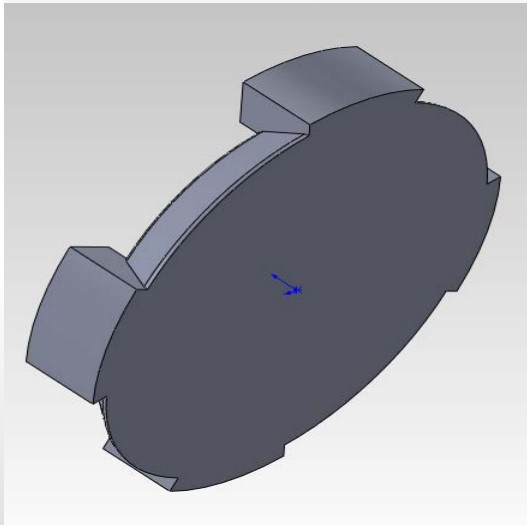
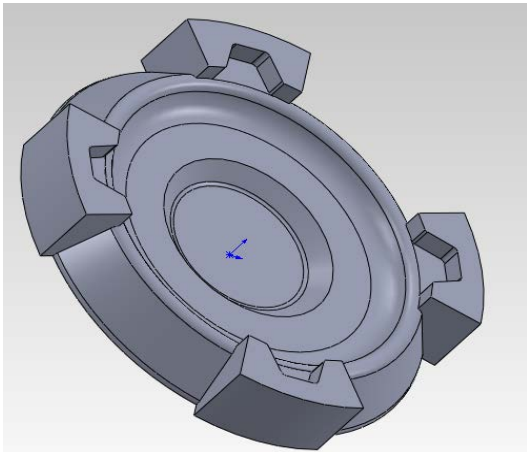
Step1 : 3D Solid model generation from the given 2D drawing



Step2 : 3D solid model of support master patterns (TOP + Bottom sides)



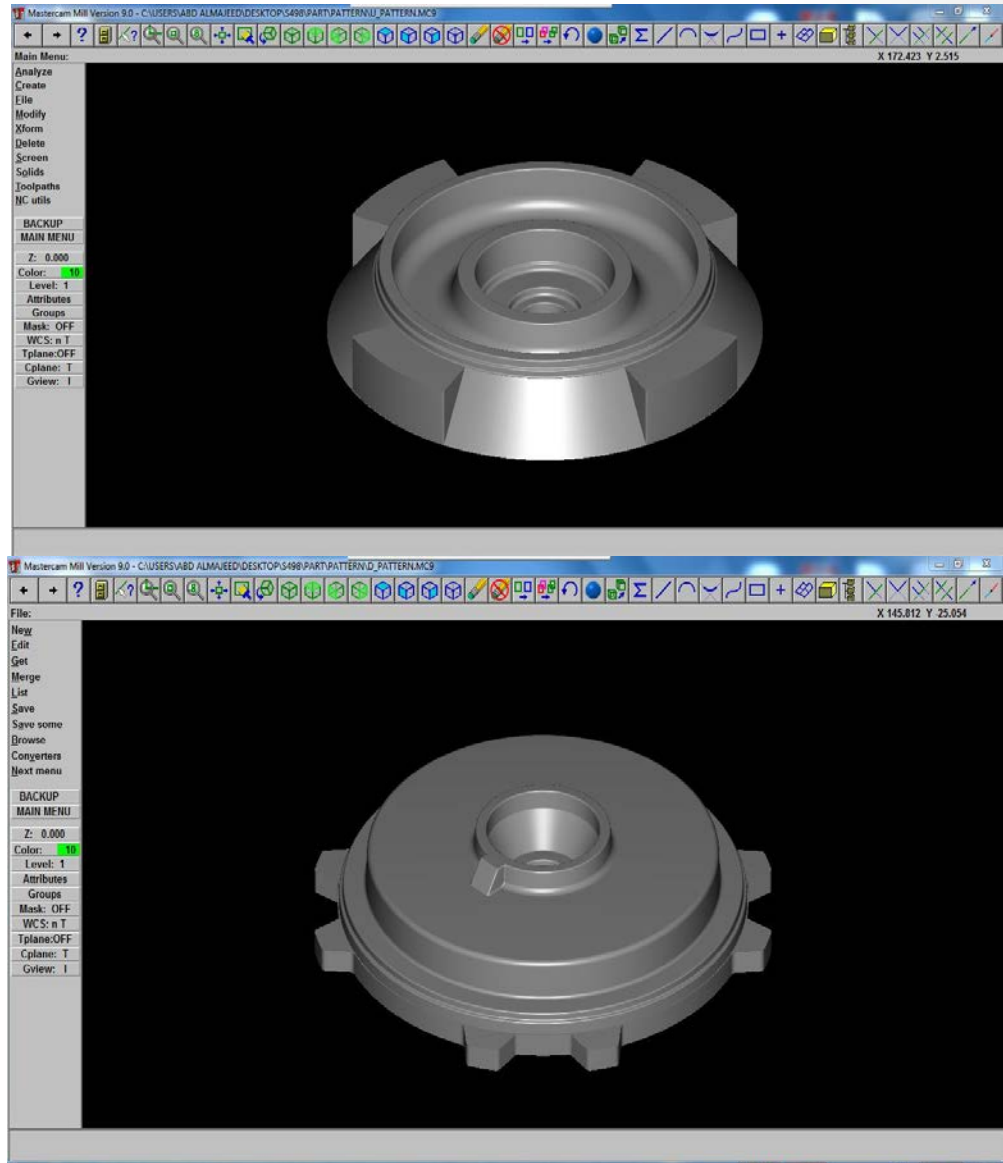
Step2 : 3D solid model of support master patterns core box (top and bottom sides)



Step3 :CAM system for support pattern (top and bottom sides)

MasterCam software.

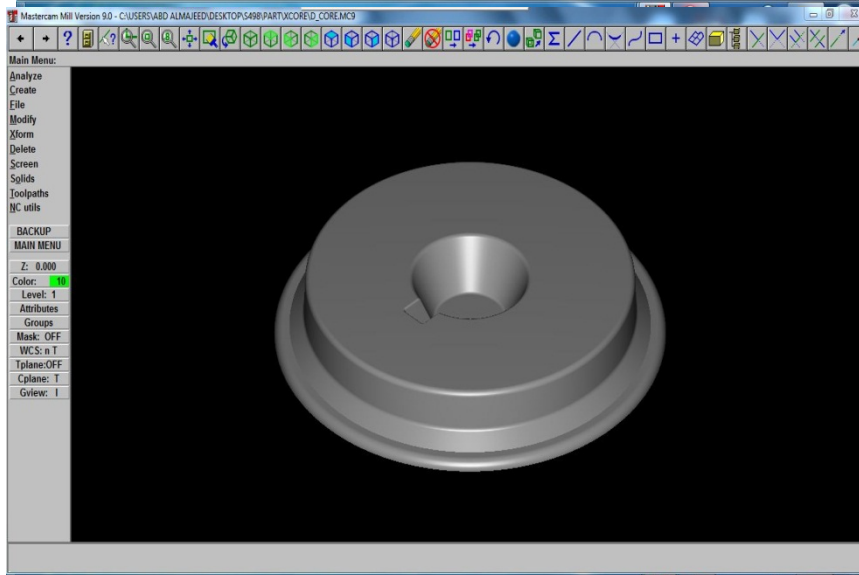
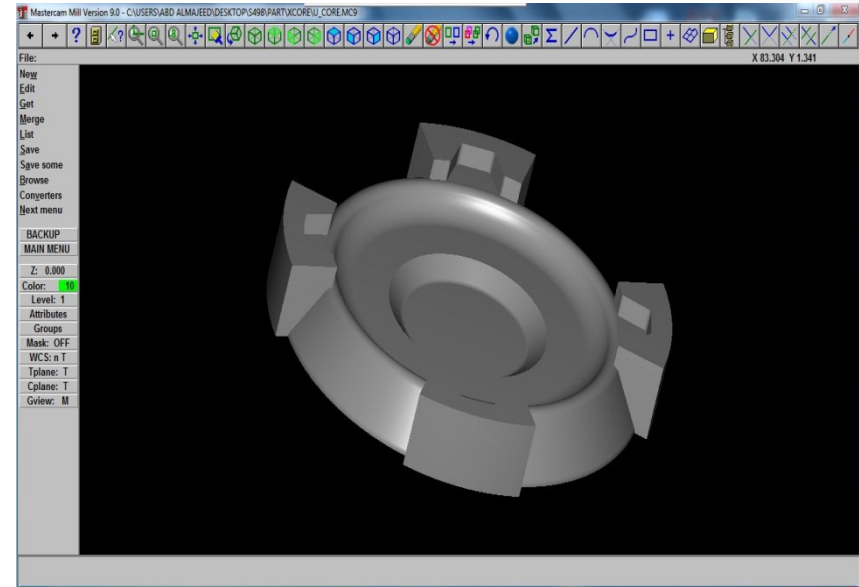
Three Cutting Process:
Facing,
roughing and finishing
process.



Step3 :CAM system for master core pattern(top and bottom sides)

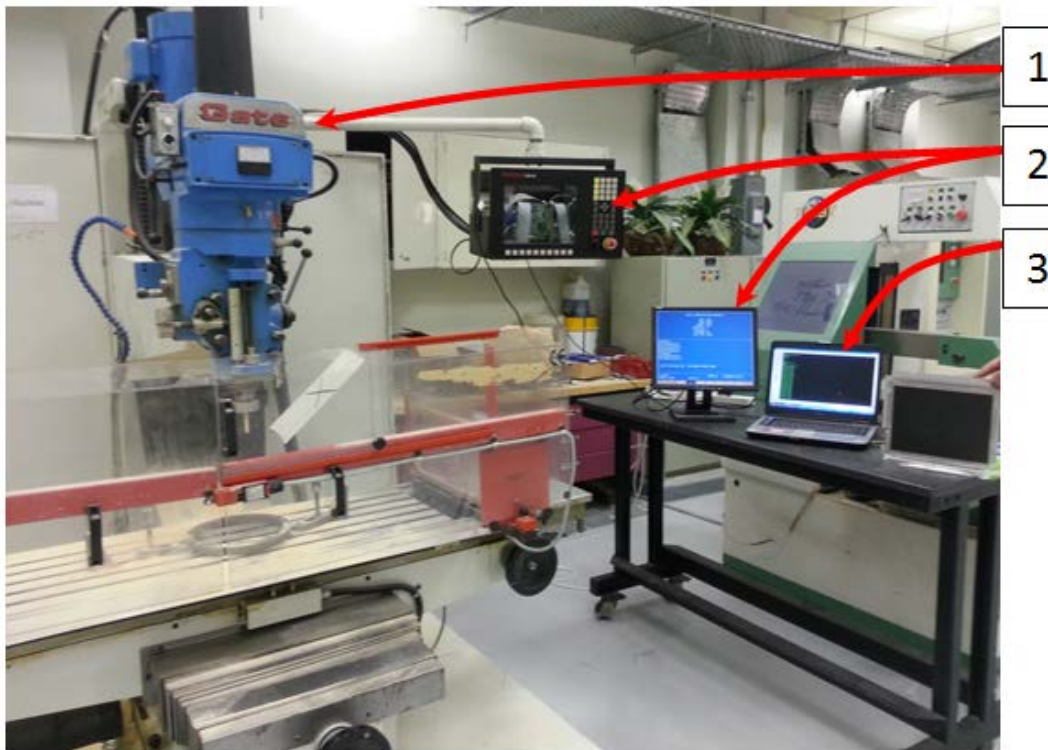
MasterCam software.

Three Cutting Process:
Facing,
roughing and finishing
process.



Step4 :G-code program and CNC machining

- Developed G-code from CAM system will be used by Anilam CNC controller generates the master patterns.



1

2

3

Experimental Work-shop work:
(1) CNC Gate vertical machine.
(2) Anilam 3000 Controller and its external CRT.
(3) PC laptop used as DNC system.

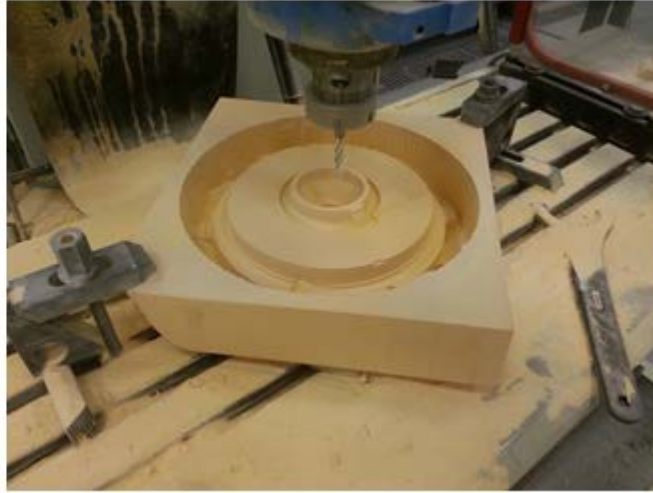
Step4 :G-code program and CNC machining : Raw material preparing



Step4 :G-code program and CNC machining :
Mounting raw material and setting pattern reference



Step4 :G-code program and CNC machining : Milling the resin top pattern



Step 5 : Develop resin core box :

Resin patterns (top and bottom half) after removing external waists



Step 5 : Develop master resin core box :

Resin master core patterns after removing the external waists



Step 5 : Develop resin core box :

1- releasing agent coating

2- resin core box frame,

3 and 4- resin casting,

5- flip over the resin box,

6- remove the master pattern from resin core box.



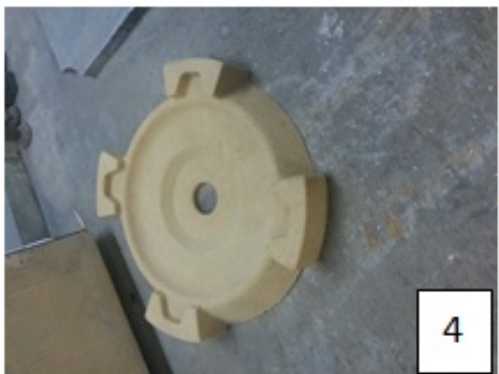
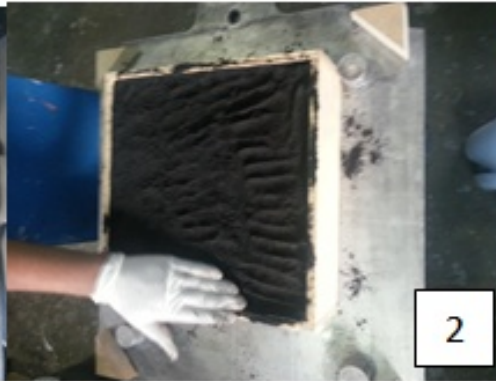
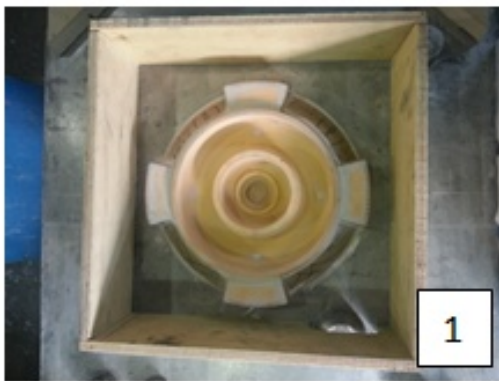
Step 5 : Develop resin core box :

Final resin core box and after releasing agent coating

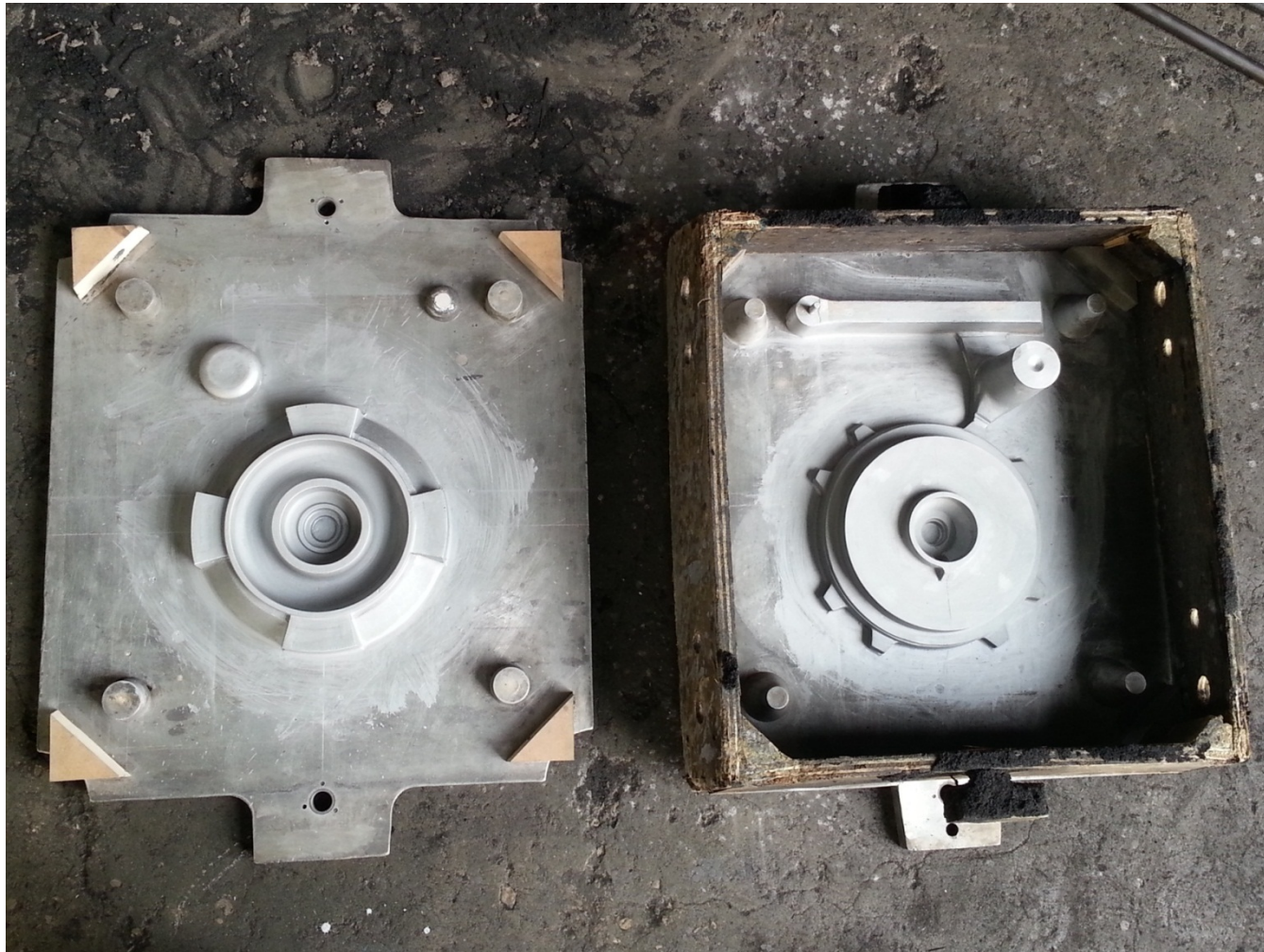


Step 6 : Sand molding and casting process:

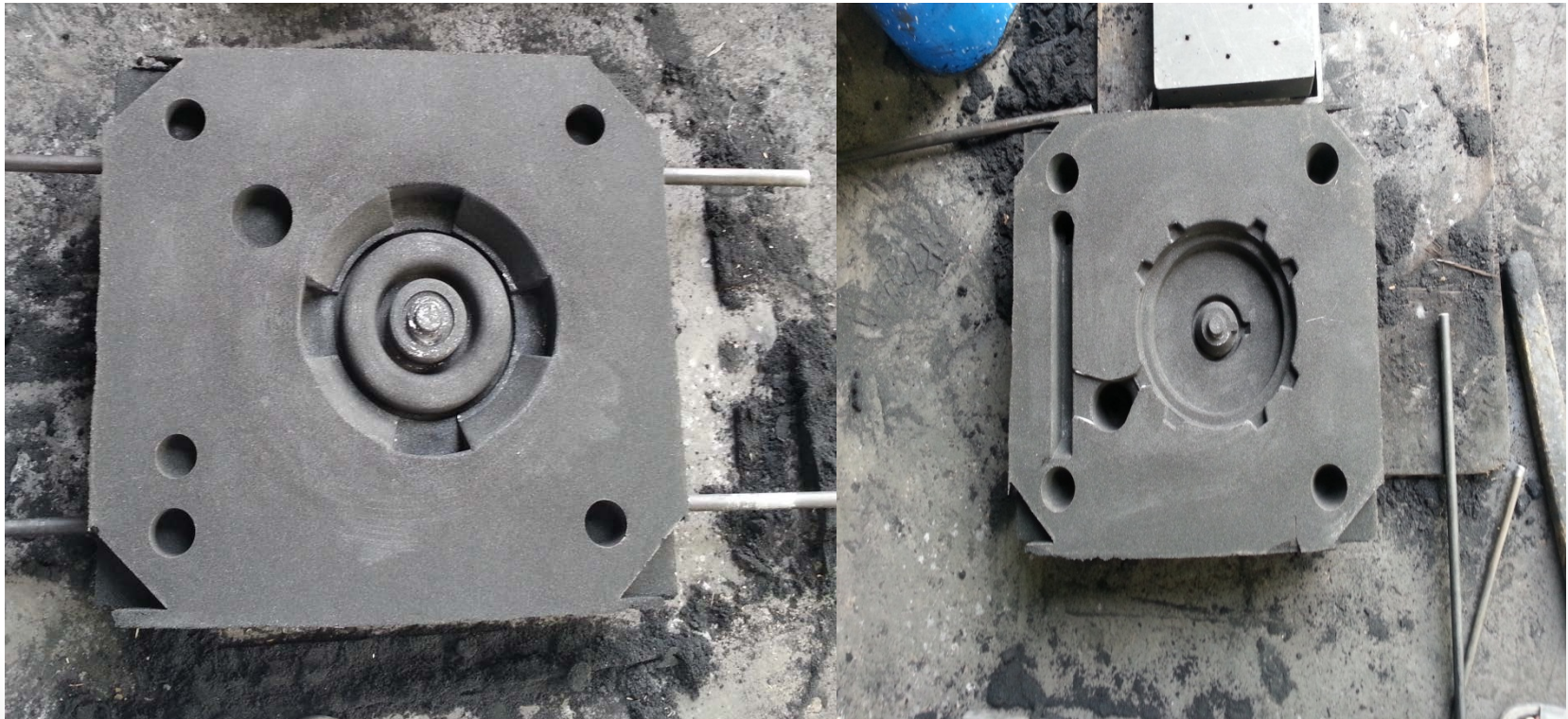
- 1-Pattern setting in Cope,
- 2- Fill in green sand,
- 3-Cope after removing the pattern,
- 4-Sand core,
- 5-Insert and checking the contact between core and cope surfaces.



Step 6 : Sand molding and casting process:
Molding flask (cope and drag) assembly Pattern molding plate



Step 6 : Sand molding and casting process:
cope and drag molding + riser + sprue + gating system



Step 6 : Sand molding and casting process: Core assembly



Step 6 : Sand molding and casting process:
Close the flask



Motor-pump support after casting process, shot pasting and grinding



Motor-pump support after finishing



Summery and Conclusions and Suggested Future work

- The rapid prototype(RP) is important technique in development and introducing new innovated products for industries and public.
- Prototype(RP) is commonly used to test the functionality and efficiency of the product before going to actual production line. This will save the time and costs e.g. tooling cost and manufacturing cost.
- Rapid prototype technique is monopolized by modern industrial countries. The main objectives from the current project are transferring this type of technology to Saudi Arabian industries.
- In can be concluded, rapid prototype technique can be used in Saudi Arabian industries to develop a new innovated products.
- As future work, it is recommended to investigate different RP direct methods to manufacture the resin patter and core box directly from the developed 3D CAD file using 3D resin printer.

*Thank you for
listening...*