GROUP-07

ME-549
Additive Manufacturing

Exploring the possibilities Manufacturing musical instruments through additive manufacturing

Can we make musical instruments through AM processes , if yes which ones?

To learn them let’s have a quick intro of the history of AM processes

AM processes are first introduced in the 1980s to serve the highly specialized needs of model making, AM combined with advanced computer-aided design (CAD) emerged as a versatile technology platform for product development

Compared to traditional manufacturing methods such as machining, molding, and forming, AM permits the development of a model with complex geometries easily.

Since the models can be built without the need for expensive molds, process planning, and skilled labor, AM permits design flexibility.

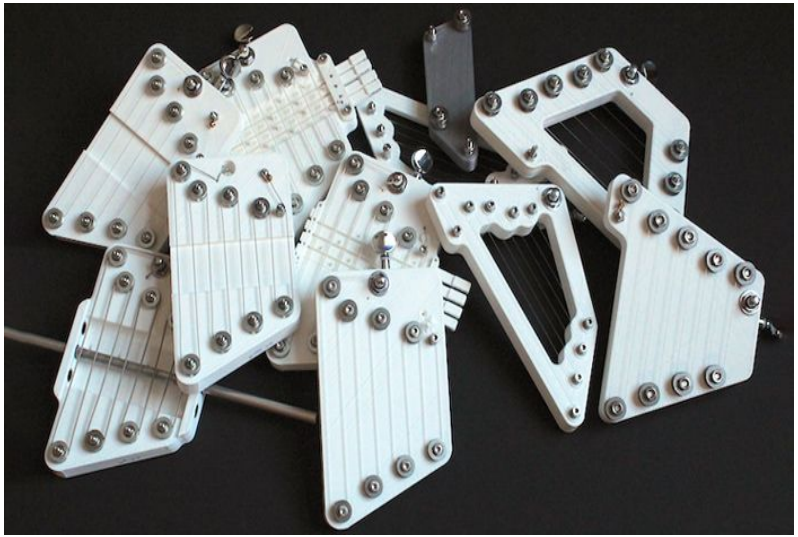
In the last two decades, AM has evolved significantly and is capable of producing fully functional end-use parts.AM has been established in various engineering applications like biomedical, aerospace, defense, and construction.

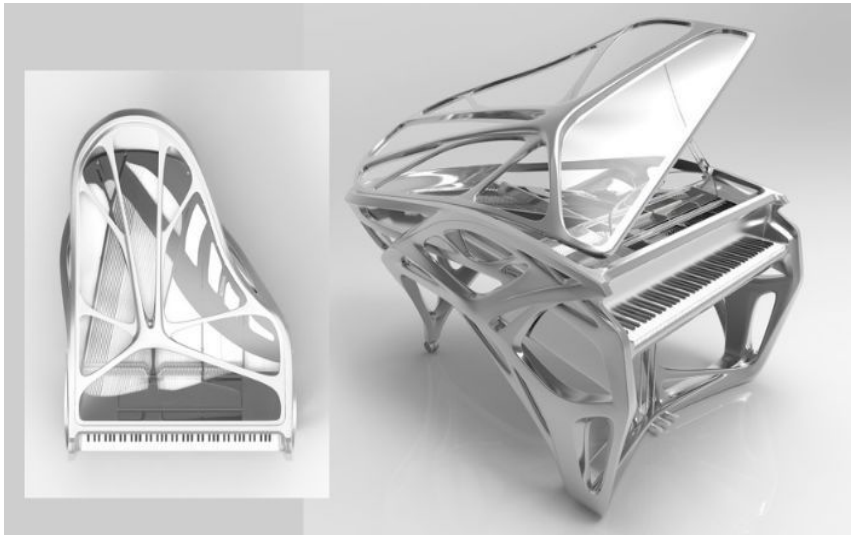
However among all these applications its application in musical instrument manufacturing is overlooked.Few papers written by the ones who worked on use of polymers as materials for AM processes even stated that AM have a bright future in wind based musical instruments.

https://doi.org/10.1021/acs.chemrev.7b00074

https://doi.org/10.1016/j.compositesb.2018.02.012

AM processes can also be used for manufacturing of other instruments than wind based ones like eg guitar, violin, piano .. etc;





Why ? challenges and opportunities

Innovative - hybrid creation - Sustainability - Aesthetics

Post processing - sound quality

Customization - Complex Designs - Light weight construction - prototyping and Experimentation & iteration - hybrid instruments - Accessibility

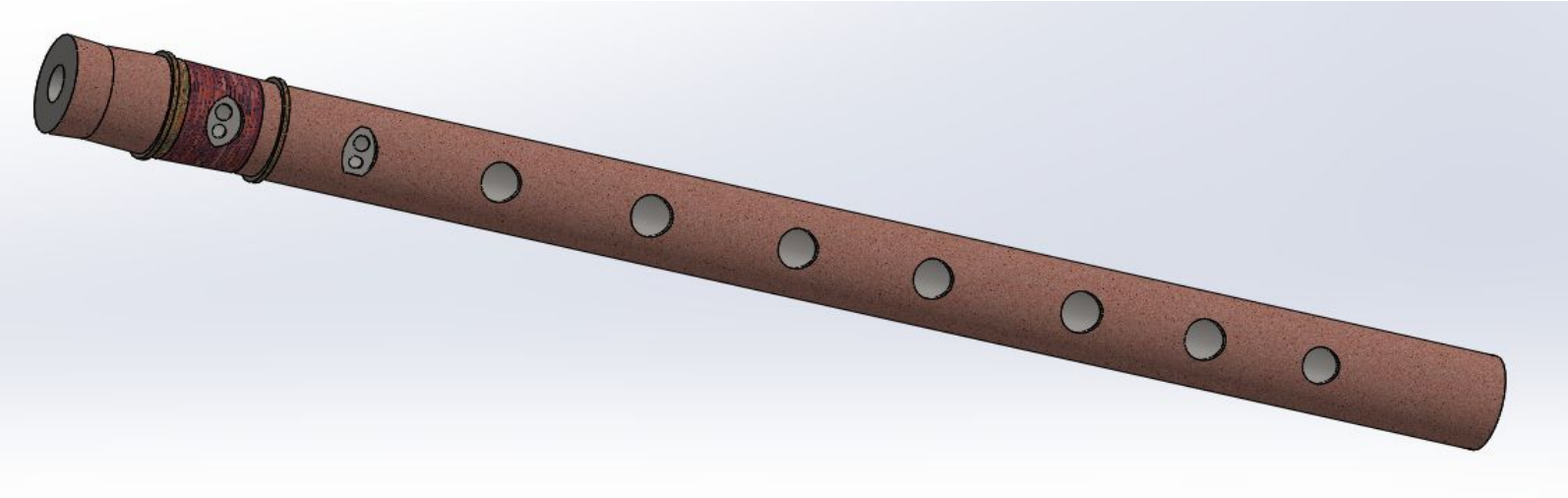
Acoustic simulation and modelling

After reading about manufacturing of musical instruments through Additive Manufacturing. We thought of making a wind based instrument ,for better understanding of the challenges in one have to face making one . We opted to make a flute Through 3D printing , as making a flute need very good accuray .

*We made few models for the flute and tried to 3D print it those lacked stability and failed 5 attempts with 5 different models .

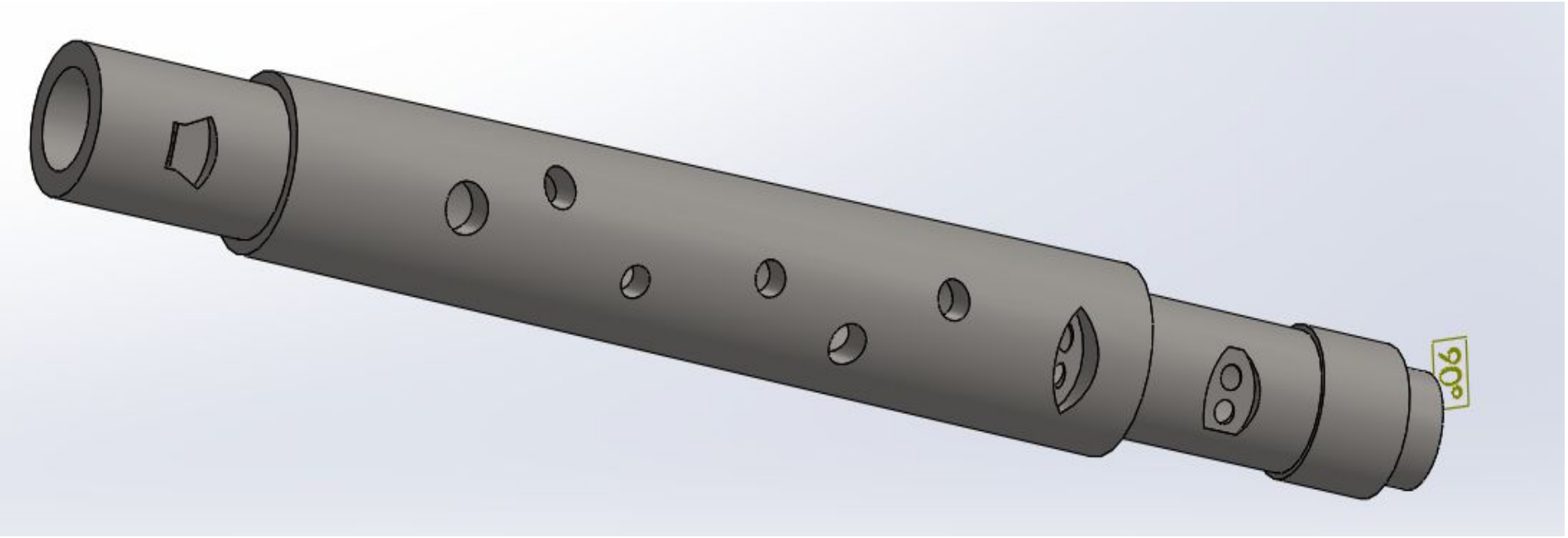
We attached those models below.

(MARK-1)



Our models

(MARK-2)



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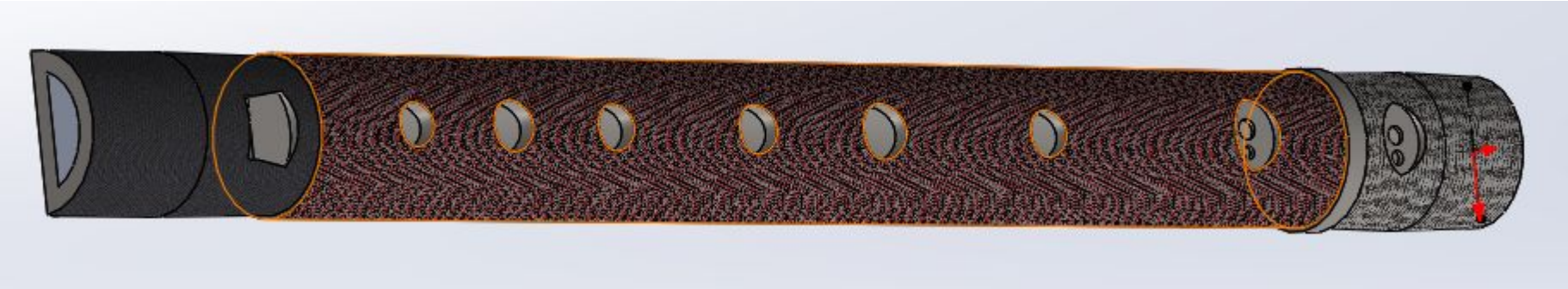

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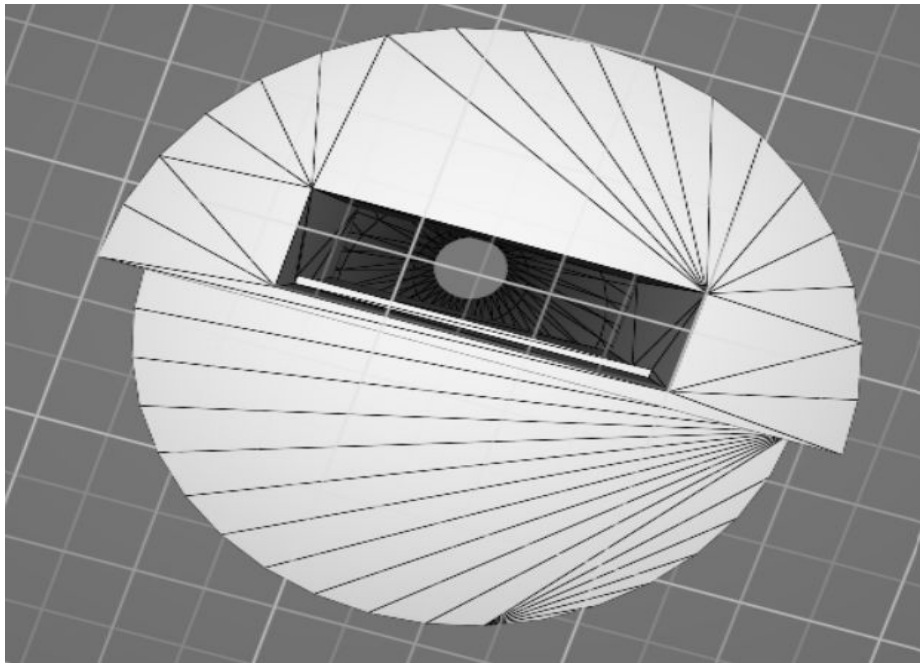
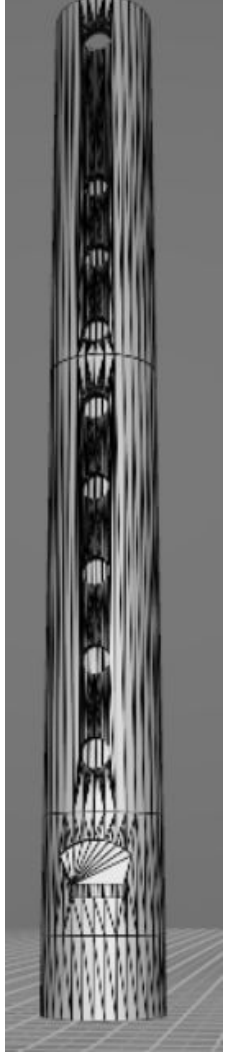
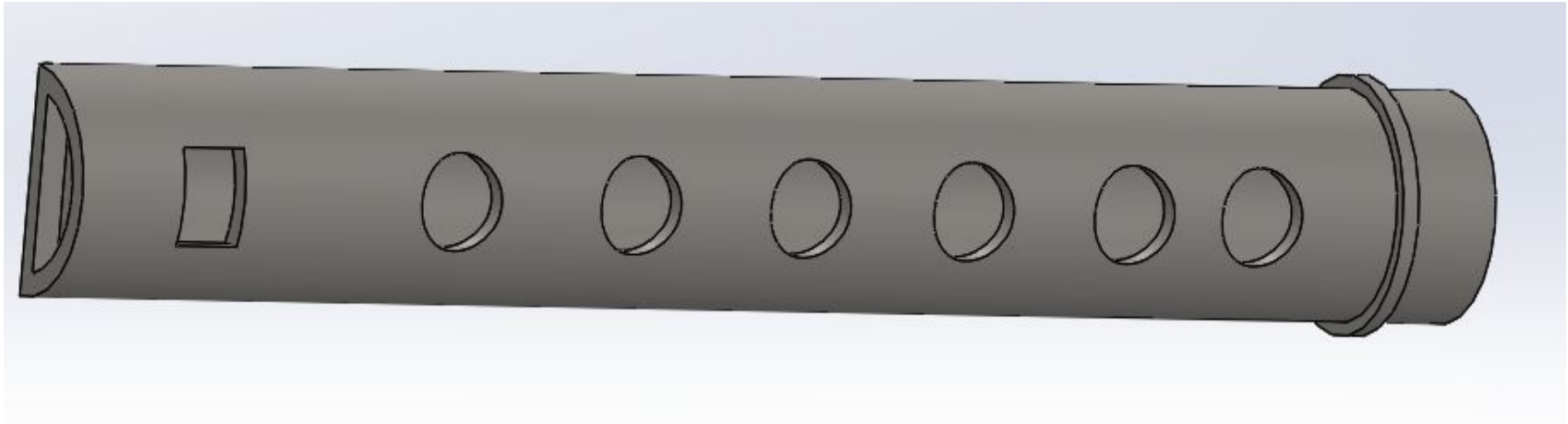




(MARK-5)



These typeof customized designs are possible. So we can open and close the holes accordingly to produce different acoustics.

Here you can find the video of 3d printed flute

https://www.youtube.com/watch?v=jlq5R84TlVw

Whistle

Conclusion

ADVANTAGES:

- By considering the AM for 3D printing musical instruments gives advantage for designing customizable structures and we can easily change the design and print.
- Generally for creating a musical instruments leads more waste of material but by AM we will have very less wastage of material.
- The price for making musical instruments is less than the traditional manufacturing of musical instruments.
- We can also save time and energy consumption by making musical instruments with 3D printer.

- By considering 3D printing we can minimize the post processes required.
- We can reuse the material in 3D printing which will save cost for material and wastage of materials.
- If required 3D printing helps in mass production.
- The major advantage is it will be easy to experiment on designs of musical instruments because it takes less time and energy comparative traditional process.
- We select materials that eco-friendly PLA, Polyethylene, Recycled PETG etc.

THANK YOU