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Duck Optimization for Additive Manufacturing Using Generative Design Fluids Path in Fusion360

Patel Mann B.[1], Parekh Abhishek J.[2] Vaghasiya Yagnik L[3]
[1, 2, 3]*Student, Mechanical Department, SSASIT, Surat*

Abstract: Generative Fluid in Fusion 360 is the recently launched cutting edge technology which is revolutionary for those companies which produces parts and components working on fluid. They always thrive for weight reduction and minimum pressure drop of their components along with no sacrifice at their performance. This can now be done by this new technology at their specified rate. But the cost of running one simulation is equitable for design which it gives to us.
Keyword: 1. Additive Manufacturing, 2. Computational fluid dynamics, 3. Computer aided design, 4. Generative Design, 5. Topology optimization 6. fluid mechanics

I. INTRODUCTION

Industries working on principles of Fluid mechanics are inseparable part of manufacturing sector. You just name and that sector would surely have Fluid Mechanics applications. Fluid in the sense both liquid and gas are studies holistically. Equipment's or parts working /holding or passing fluids are very hard to optimize generally. In corporate world, performance is the ultimate aim which can be achieved by various parameters out of which part optimization is one. In convectional designing, a part may be designed by keeping more than required factor of safety and whole raw design. While if we see this with detailed view in application, we come to know that most of these part remains unutilized and if removed, it won't create and negative impact on working of part. This can be known in latest technology launched just a month ago of generative fluids in Fusion 360. Design simulation is run considering additive manufacturing as manufacturing method. In this proposed paper, we optimized two components and their simulation were successfully carried out.

II. GENERATIVE DESIGN FLUID PATH

The goal of the fluid path study in generative design is to create an optimized fluid path volume for lowest pressure drop based on geometric and performance requirements that you specify. The optimized pressure drop often leads to better performance and more energy efficient design.

III. OPTIMIZATION 1: 3D PRINTING PART COOLING DUCT OPTIMIZATION

In our first experiment we took the cooling duct from Voron 2.4 3d which was using blower fan having 6 CFM flowrate2.In second step of optimization we Provided geometrical constrain to our model by separating the body in three main criteria which is required for generative design (i)preserve(green) (ii)starting shape(yellow) (iii)obstacle(red) in our case we did not have any obstacle so define only define fire two constrain3.In third step we provided design criteria for generative design in which we define our inlet and outlet of out body along with simulation criteria of minimum pressure drop.4.In fort stage we define our fluid which is air for our simulation after that we upload our entire design to cloud for simulation using generative design.

After simulation we got result which has optimized design which can be manufacture with additive manufacturing
>Performance enhancement

1) Weight reduction from 221.266gm to 97.863 gm,54%weight reduction
2) Achive zero percent pressure drop at outlet of duct
3) Reduce volumetric mass

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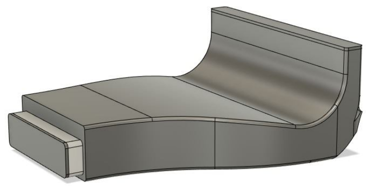


1.Intial component.

2. Geometric Design Constrain

3.Fluid path simulation.

4. Optimized Component.

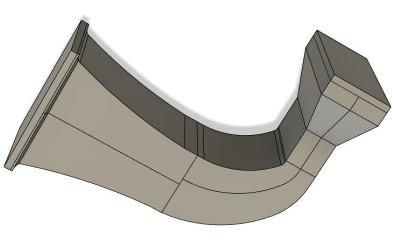
IV. OPTIMIZATION 2: AIR CONDITIONING DUCT OPTIMIZATION

In our second experiment we took the duct from central air conditioning system which was using blower fan having 60 CFM flowrate2.In second step of optimization we Provided geometrical constrain to our model by separating the body in three main criteria which is required for generative design (i)preserve(green) (ii)starting shape(yellow) (iii)obstacle(red) in our case we did not have any obstacle so define only define fire two constrain3.In third step we provided design criteria for generative design in which we define our inlet and outlet of out body along with simulation criteria of minimum pressure drop.4.In fort stage we define our fluid which is air for our simulation after that we upload our entire design to cloud for simulation using generative design.

After simulation we got result which has optimized design which can be manufacture with additive manufacturing

>Performance enhancement

1) Weight reduction from 71323.19gm to 5151.39 gm,92.77%weight reduction
2) Achive only 4% percent pressure drop at outlet of duct
3) Reduce volumetric mass



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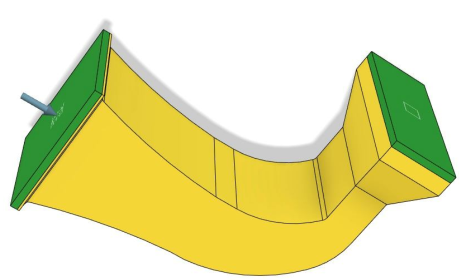
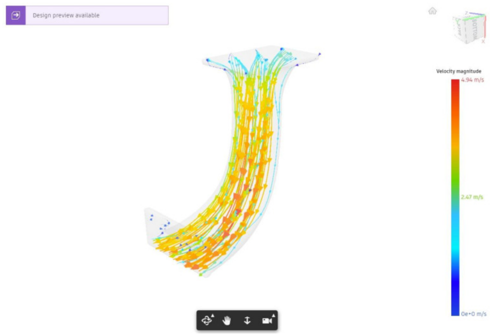


2. Geometric Design Constrain

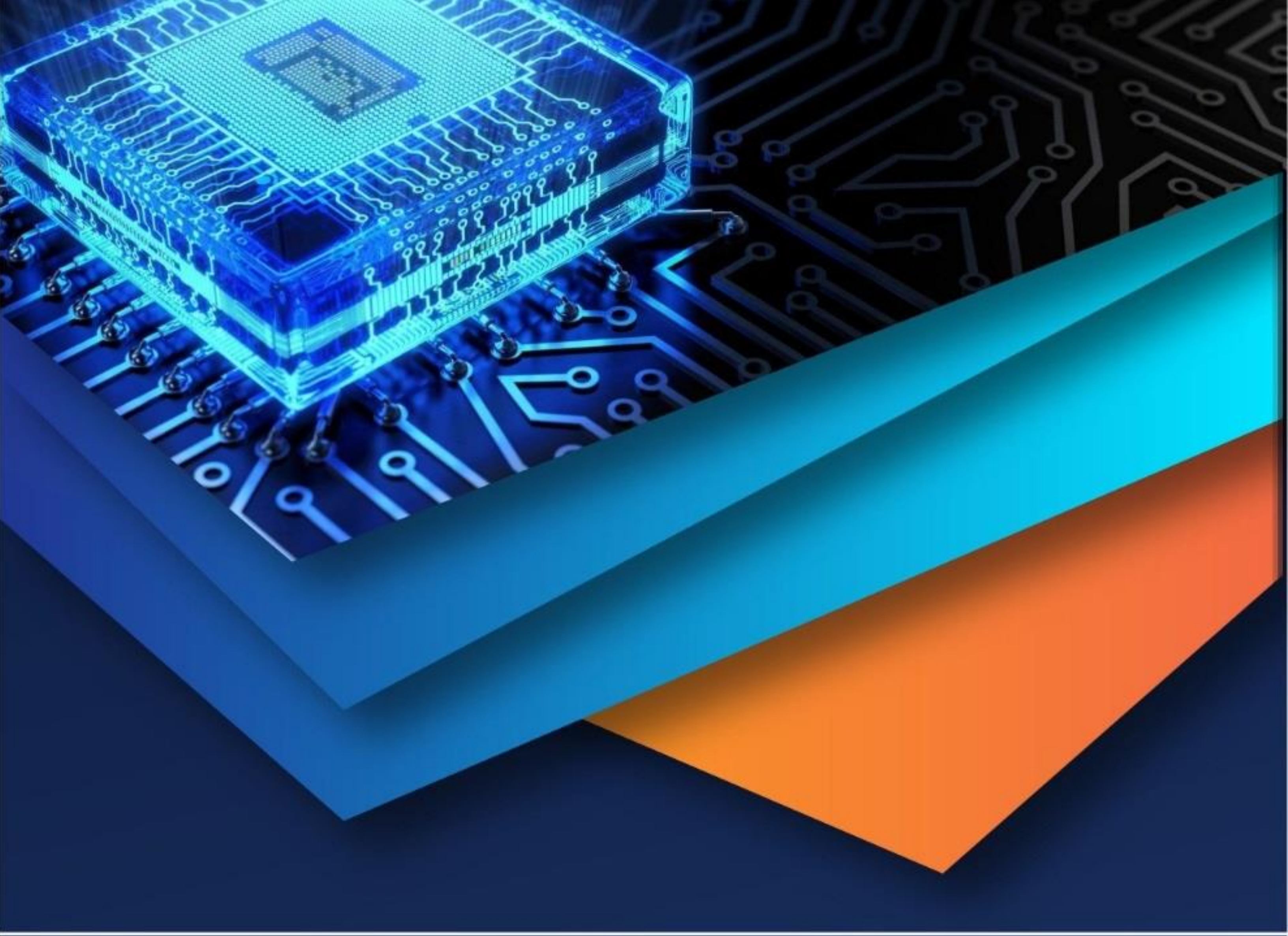


3.Fluid path simulation.

4. Optimized Component.

V. CONCLUSION

After completing the detailed analysis and simulation work, we have been victorious in drastically reducing weight of Components employing fluid flow. In first part we achieved 54 percent weight reduction at zero pressure drop while second component was more success as we achieved 92.77 percent of weight reduction at just 4 percent pressure drop.



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