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# ANALYSIS AND WEIGHT OPTIMIZATION OF CENTRIFUGAL BLOWER FOR CORROSION RESISTANCE MATERIAL

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**ABSTRACT:-** Weight of the centrifugal blower is reduced along with increase in its strength, by optimization of static analysis using FEA for the material MS and Food Grade Steel. In this project work modal analysis is done for the material MS and Food Grade Steel which is a food grade material and regular recurrence of the material is contrasted and recurrence of outer excitation to diminish vibrations and disappointment of the divergent blower fan. CFD examination is accomplished for the material MS and Food Grade Steel, in order to check fluid flow pattern, to check back flow of the fluid, to check optimum region for maximum velocity and maximum pressure of the fluid also to enhance the discharge of the blower.

## I. INTRODUCTION

The centrifugal fans with impellers having blades of Airfoil section are considered as the high efficiency impellers among the six types Airfoil blades, Backward Inclined single thickness blades, Backward curved blades, forward curved blades, radial tip blades and radial blades. The present study gives the design methodology for these high efficiency impellers which include the numerical design procedure and the CFD analysis of it. The CFD part is used for improvement the results of Static Pressure produced at the passage to the impeller, static effectiveness. The CFD enhancement additionally assisted with improving the stream design through the radial fan framework. Outward super machines are regularly utilized in many air-moving gadgets because of their capacity to accomplish moderately high-pressure proportions in a reduced design contrasted and hub fans. They are regularly found in gas turbine motors, warming ventilation and air conditioning systems, and hydraulic pumps. Because of their widespread use, the noise generated by these machines often causes serious environmental issues. The turbo machinery noise is often dominated by tones at blade passage frequency and its higher harmonics. This is mainly due to strong interactions between the flow discharged from the impeller and the cutoff of the casing. In addition to discrete tones, the broadband noise is also generated due to the separation, turbulence mixing, and the vortex interaction process.

## II. LITERATURE REVIEW

[1] Christopher L. Banks and Sean F. Wu, "Prediction and reduction of centrifugal blower noises" Journal of Acoustical Society of America, Volume 103, Number 5, pp. 3045-3045, May 1998. In this project work this paper is used to study Prediction and reduction of centrifugal blower noises. In this work, a simple fan model was used in the numerical calculation. The fan model has a centrifugal impeller and a wedge studied by Weidemann. This model was used in his experimental research, and the numerical results were compared by the authors. The reasons to adopt his model are two-fold: The first reason is that the acoustic characteristics are well-established by the authors. The second is that the scattering effect of casing was not included in this model. Therefore, the acoustic Characteristics of splitter impeller were studied with this fan model. It was found that the splitter impeller reduces the peak level at BPF and slightly increases peak level at 2nd harmonic. This is attributed to the more uniform discharge flow-field in splitter impeller. Optimal position of splitter was found to be in jet region for improved acoustic characteristics.

[2] Claudia Marcela Méndez, Mónica Mariela Covinich and Alicia Esther Ares, "Resistance to Corrosion and Passivity of 316L Stainless Steel Directionally Solidified Samples" INTECH open Science book- This book is used to study different corrosion resistance test of SS316L in order to reduce corrosion problem of blower. This work aims to study the overall influence of the variation of the structure (equiaxed, columnar and columnar-to-equiaxed transition, CET) on the corrosion resistance of 316 stainless steel in aqueous 3% NaCl (pH = 5.5) using cyclic potentiodynamic polarization techniques and electrochemical impedance spectroscopy (EIS) and investigate the relationship between the corrosion resistance of material and the secondary dendritic spacing evolution.

[3] C. Cuevas Arteaga1, J. Porcayo Calderón2, C. F. Campos Sedano3, J. A. Rodriguez, "Comparison of Corrosion Resistance of Carbon Steel and Some Stainless Steels Exposed to LiBr-H2O Solution at low Temperatures" International Journal Of Electrochemical Science, Volume 7, 2012, pp. 445-470. A corrosion evaluation has been made using the electrochemical current and potential noise technique (EN), polarization curves (PC) and conventional weight

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loss method (WL) to determine the corrosion performance of a carbon steel exposed to LiBr-H2O (50% wt.) solution at 25, 60, and 80°C. From the noise measurements, the resistance noise (*Rn*) was determined, and then the Stern-Geary equation and Faraday's Law were applied to determine the mass loss. The mass loss obtained from EN after 15 days of exposure was compared to that obtained from WL, observing the same behavior with temperature. The electrochemical noise time series and the spectral noise impedance were used to analyze the changes in corrosion activity of carbon steel under the experimental conditions. SEM observations of the corroded samples indicated that the carbon steel suffered localized corrosion in a generalized way; these results were according to the pattern of noise signals. To support the corrosion behavior obtained from EN, ED's analysis of the corrosion products together with atomic absorption analysis of the corrosive solution containing the corrosion products were also made. A comparison of corrosion kinetics of several stainless steel together with that of carbon steel showed that carbon steel has some features that make it corrosion resistant compared to some stainless steel.

## III. FEA Model of Centrifugal Blower Fan

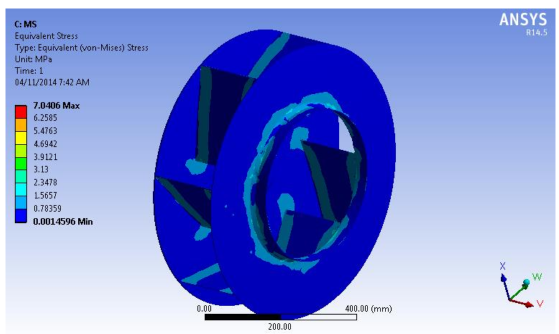


Fig (14): Equivalent Stress of MS blower Fan, MPa

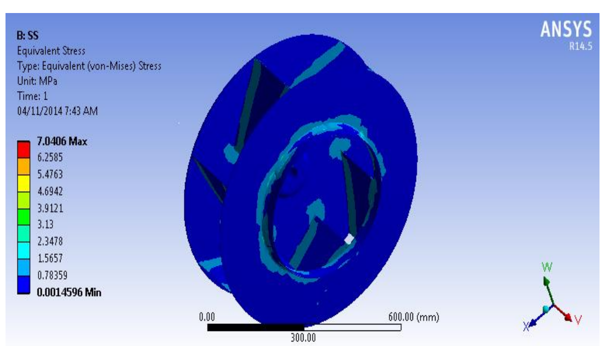


Fig (15): Equivalent Stress of SS blower Fan, MPa

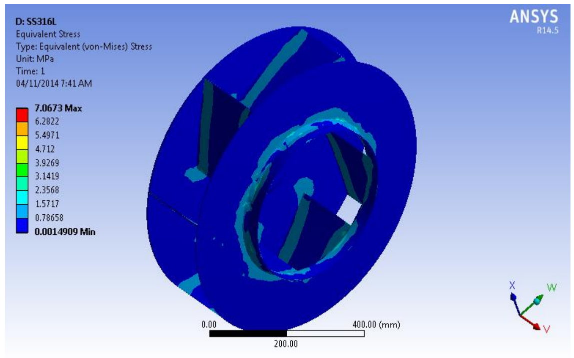


Fig (16): Equivalent Stress of SS316L blower Fan, MPa

## IV. STATIC ANALYSIS FOR TOTAL DEFORMATION

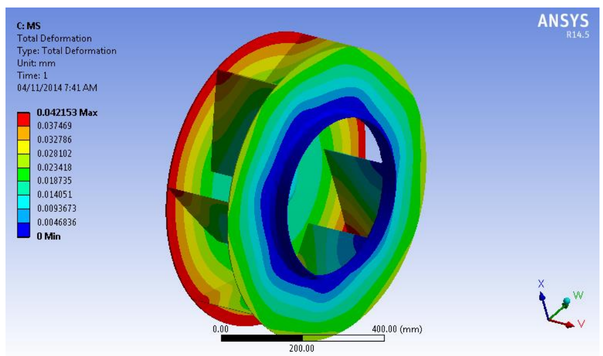


Fig (17): Total Deformation of MS blower Fan, mm

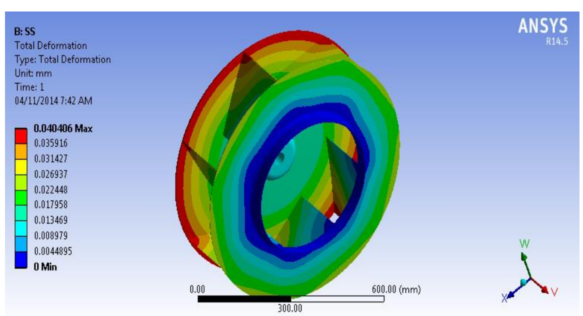


Fig (18): Total Deformation of SS blower Fan, mm

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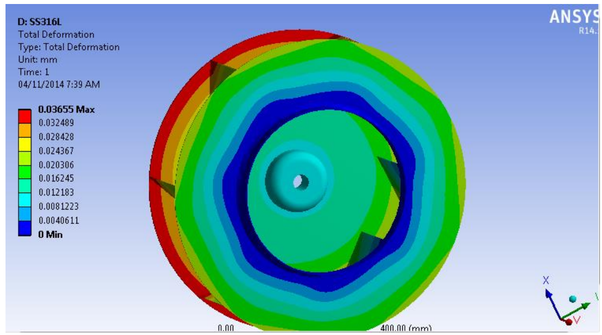


Fig (19): Total Deformation of SS316L blower Fan, mm

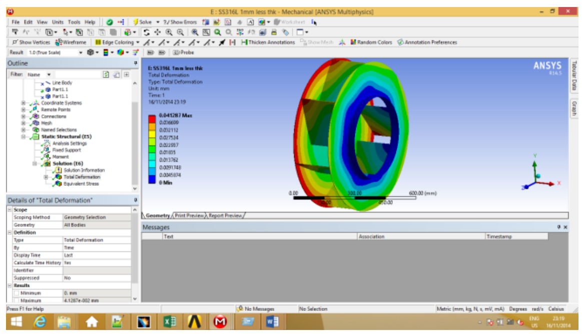

Fig (20): Total Deformation of SS316L blower Fan, by reducing 1mm thickness

## V. RESULTS

| Sr. No. | Material | Stress (MPa) | Deformation (mm) | Weight (Kg) |
|---|---|---|---|---|
| 1 | MS | 7.0473 | 0.0421 | 35.93 |
| 2 | SS | 7.047 | 0.0404 | 35.93 |
| 3 | SS316L | 7.067 | 0.0365 | 36.394 |
| 4 | SS316L (Opt) | 6.68 | 0.041287 | 33.073 |

## VI. CONCLUSIONS

1. Corrosion problem of the centrifugal blower is reduced (93.7%) by using material SS316L (Food Grade Steel), which is profoundly consumption safe. Consequently there won't be any blending of elements of erosion in natural product pulps as examined in issue definition.
2. Weight of the Centrifugal blower is optimized by using SS316L material (i.e.33.073 Kg which is less as compared to MS material i.e. 35.93 Kg).
3. SS316L material having minimum deformation therefore, there are less chances of failure of the blower fan as contrast with other two materials. Henceforth the strength of blower increments. From above result we conclude that SS316L steel is the best material for blower manufacturing as per industrial requirement.

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