**Comparsion of Greet turbine with turbines of Robert and Giorgini**

**1- Introduction:**

The purpose of this study is to show the differences between the three turbine designs of Geert, Giorginin and Robert, show in figures [1-3].

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| Figure (1) – Greet Turbine | Figure (2) – Robert Turbine |
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| Figure (3) – Giorgini Turbine | |

The external dimensions in the radial axis have been unified so the comparsion will be reasonable. At the first, we have built the 3D model of each turbine using SolidWorks software depending on the given shapes in the patents with respecting of the unification in the radial direction, as shown in the figures (4-6).

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| C:\Users\Ibrahim Bakry\Desktop\CONRAD_Comparison\Reseller\Greet.JPG | C:\Users\Ibrahim Bakry\Desktop\CONRAD_Comparison\Robert\Robert1.JPG |
| Figure (4) - 3D Greet Turbine | Figure (5) – 3D Robert Turbine |
| C:\Users\Ibrahim Bakry\Desktop\CONRAD_Comparison\Giorgini\Giorgini1.JPG | |
| Figure (6) – 3D Giorgini Turbine | |

After building the 3D models, we have started doing the CFD study on each model; we measured pressure, Velocity and moment on each one. We will start presenting the results of each turbine and focus on the positives and negatives of each model and in the end, we will compare them all.

**2- Giorgini’s Turbine:**

We can see it in figure (6), the results of CFD study represented in figures (7-9). In the figure (7), we can see that maximum pressure at the end of the directors is 608 Pa. we will use this value for the comparsion later. In figure (8), we can see the streamlines where they are entering the directors and go out from the top of the blade disk, in other words the exit is parallel on the inlet, and aerodynamically this reduce the efficient of the turbine and we can say here that the flow is not streamlined. These designs we use it for venting the air of the buildings, but with different efficient blade designs. In Giorgini design, we can see that the blade-disk is traditional one with a little number of blades. In the figure (9) we can see the maximum velocity in the flow equal 22 m/s, and even less at the end of the directors, where interest us.

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|  | | Figure (7) – pressure Contours on Giorgini Turbine. |
| Figure (8) – Velocity Streamlines. | C:\Users\Ibrahim Bakry\Desktop\CONRAD_Comparison\Giorgini\SLssogior 1080.png | |
| C:\Users\Ibrahim Bakry\Desktop\CONRAD_Comparison\Giorgini\Velogior 1080.png | | Figure (9) – Velocity Contours on Giorgini Turbines. |

**3- Roberts Turbine:**

We can see it 3D in the figure (5), and the results in the figures (10, 11). In the figure (10), the maximum pressure is about 2022 Pa, and the maximum velocity in figure (11) is 33 m/s and it is not at the end of the directors, which is about 16 m/s. in general we can see that Roberts turbine aerodynamically is good where the flow is streamlined. We can say roughly that it is better than Georgini’s turbine.

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| C:\Users\Ibrahim Bakry\Desktop\CONRAD_Comparison\Robert\PRe_Rob 1250.png | | Figure (10) – pressure contours on Roberts’s turbine. |
| Figure (11) – Velocity contours. | C:\Users\Ibrahim Bakry\Desktop\CONRAD_Comparison\Robert\Rob 1250.png | |

**4- Geert’s Turbine:**

We can see it as a 3D model in the figure (4). The results are shown in figures (12-14). In the figure (12), we can see the maximum pressure is 705 pa, and from the figure (13), we can ensure of stream-linearity of the flow. In figure (14) we can find that the maximum velocity is 37 m/s, but at the end of the directors it’s about 18 m/s, but we see lots of blue space because the scale on the indicator is bigger than other indicators.

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| C:\Users\Ibrahim Bakry\Desktop\CONRAD_Comparison\Reseller\New folder\Pre_Reseller 0680.png | | Figure (12) - Pressure Contours of Geert’s Turbine. |
| Figure (13) – Velocity Vectors. | C:\Users\Ibrahim Bakry\Desktop\CONRAD_Comparison\Reseller\New folder\SL_Reseller 0680.png | |
| C:\Users\Ibrahim Bakry\Desktop\CONRAD_Comparison\Reseller\New folder\velReseller 0680.png | | Figure (14) – Velocity contours. |

Now, aerodynamically we can see that the turbines of Robert and Geert are the best but we need another measure, so we measured the moment on each turbine and he result show in figure (15). Note, the minus sign is just related to the direction of the axis.

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| Figure (15) – Comparisons of the three turbines |

In this figure, we can see that Greet’s turbine is the best where it is have the higher coefficient moment of rotation, and this gives angular velocity more than 300 Rad/Sec for forward velocity 5 m/s.