THE DESIGN OF 4-LEVEL IMPELLER ON CENTRIFUGAL COMPRESSOR ASSISTED CF TURBO SOFTWARE

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Abstract Compressor is a compressing device or compressing air in other words a compressor is a compressed air generator. Because of the compression process, air has a higher pressure compared to environmental air pressure (1 atm). In this Final Project the compressor is planned with an output pressure of 140 bar, a flow rate of 5000 m3 / hr, 4 levels, a shaft rotation of 15000 rpm. In the compressor planning, TURBO 10 CF software is used. Input from the software is the flow rate and pressure of each level. As output is the impeller diameter, the output pressure of each impeller. Power of each level. The average impeller diameter is 596 mm. The air coming out of each level is cooled. The cooling system is not planned in the final project.

Key words: Compressor, CF TURBO, Pressure, compressed air.

INTRODUCTION

In the current millennial era, science and technology are increasingly developing in the field of science and technology. In its development, the industrial world is very much needed and the compressor is used as a tool to help increase the pressure of compressed fluids such as air and gas. The type of compressor must be in accordance with its use and placement. One example that is used is a centrifugal compressor where the centrifugal compressor is a type of dynamic compressor.

The objective of this research is to plan a compressor with an air volume of 5000 m^3/hour and an output pressure of 140 bar.

1. The size of the impeller diameter of each level
2. The output pressure of each level
3. Shape and number of impeller blades of each level
4. Power each level
5. The output temperature of each level
6. Density

The benefit to be achieved from compressor planning is that students understand better machines in industry, in this case, the compressor.

Limited Research

1. Does not discuss the thermodynamic process on the compressor
2. Does not discuss machine installation and inspection techniques
3. Does not make/manufacture compressors.
4. Does not discuss the calculation of the finite element method for fluid flow in a centrifugal compressor
5. Does not address balancing issues
6. Does not address critical rotation.

METHODOLOGY

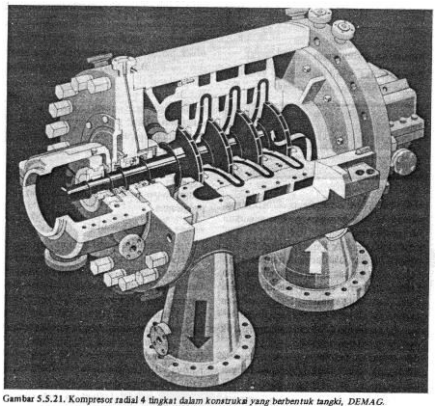
Gambar 5.5.21. Kompresor radial 4 tingkat dalam konstruksi yang berbentuk tangki, DEMAG.

Figure 1 **Example of a Centrifugal Compressor**

Research Flowchart

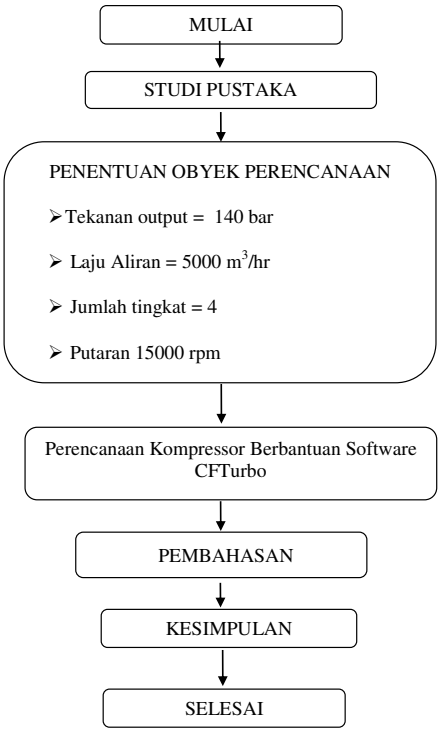

Figure 2 **Research flowchart**

Air flow rate = 5000 m^3/hour

Number of levels = 4 levels

Total air pressure = 140 bar

Rotation = 15000 rpm

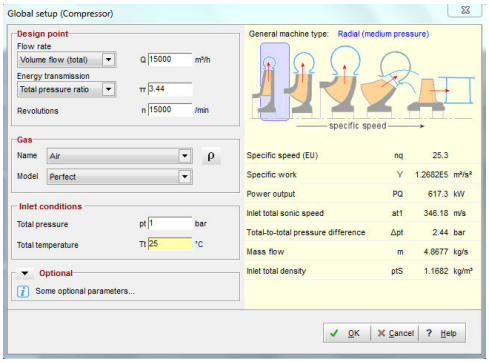

Figure 3 **Initial Display**

The Design on CF TURBO

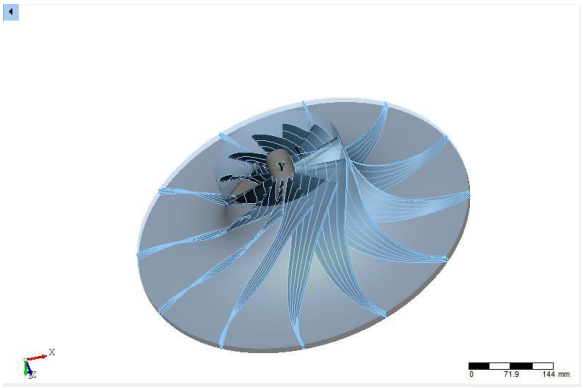

Figure 4 **The results of Impeller planning using CF TURBO**

Table 1. **Data Information for Each Level of Impeller Planning**

	Tingkat 1	Tingkat 2	Tingkat 3	Tingkat 4
Tekanan Input (bar)	1	3,44	11,83	40,7
Tekanan Output (bar)	3,44	11,83	40,7	140
Beda Tekanan	3,44	3,44	3,44	3,44
Putaran (rpm)	15000	15000	15000	15000
Laju Aliran Udara (m3/jam)	5000	5000	5000	5000
Temperatur Input (°C)	25	50	60	70
Temperatur Output (°C) Tanpa Pendinginan	174,5	183	260	279
Temperatur Output (°C) Dengan Pendinginan	50	60	70	80
Berat Jenis Input (kg/m3)	1,14	3,68	12,306	41,098
Berat Jenis Output (kg/m3)	2,07	6,40	21,322	71,059
Diameter Impeller (mm)	566	596	606	616
Suction Diameter (mm)	212	226	240	262
Power Output (kW)	205,8	708	2434,4	8375
Diameter Poros (mm)	42,2	64	97,1	147,1
Volume Spesifik Input (m^3/kg)	0,87	0,27	0,08	0,02
Volume Spesifik Output (m^3/kg)	0,48	0,15	0,04	0,01
Jumlah Sudu	12	12	12	12

Average impeller diameter =

(566+596+606+616)/4=596 mm

Total power = (206+708+2434+8375)

= 11623,3 kW = 11,6 MW

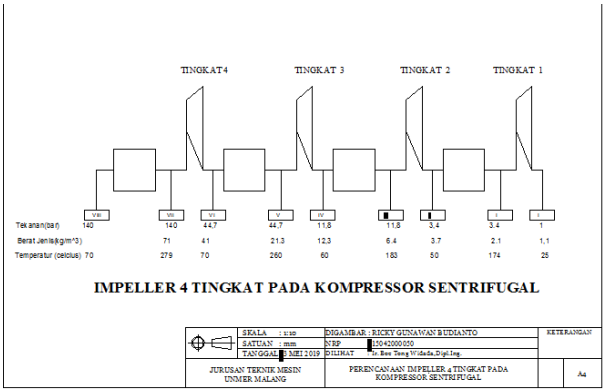

Figure 5 **Autocad Schematic of a 4 Level Impeller Planning**

CONCLUSION

In planning for centrifugal compression assisted by CF Turbo software, the impeller diameter, impeller shape, and the temperature of the air that comes out of each level are obtained. The air is cooled before being put to the next level.

For an air flow rate of 5000m^3/hour, a shaft rotation of 15000 rpm, a total power of 11.6 MW is required. This power is the sum of each power.

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