

A REPORT ABOUT WORKSHOP IN NORWAY

Everything had began in the Czech Republic when professor Hong, his colleague and students came to visit our University, because there was held the first workshop. They showed us their research and we also presented them our work. We met new people, I would call them friends, and then, some time after that, they welcomed us in Norway.

The first thing I am going to write about Norway is the fact, that I didn't know at all what should I expect of the whole trip because I have never been to Norway. But after arriving there, I was very surprised - the sunny weather, a beautiful nature and very friendly people. We had been living in the little hotel in the city of Fredrikstad, which was situated about one hour away from Oslo. Fortunately, the hotel was located very close to the Ostfold University College.

On Tuesday, we started getting familiar with the school which I found really interesting. There were plenty of study rooms where students could spend their free time studying and get ready to their following lectures. There were many schoolrooms and laboratories, as well. However, the most interesting issue for me was the school project "SHELL ECO MARATHON". It represented a race using ultra energy-efficient vehicles and the students were working together on that. They created a very interesting product and at the same time, it was a perfect example of collective work. Moreover, this is a very progressive area which has its importance for the future too.

In the following hours, we visited the workshop where Norwegian students and our representatives had own presentations. I brought a poster with me. It described my master thesis and there was also an appendix of this article. The original poster is being kept at the University.

On Wednesday, we made an excursion. We visited a company where special bricks with insulation are produced. After our visit, we couldn't miss the opportunity to explore other parts of the University, especially a research center where the incubator can be found. It is really helpful for starting projects. During free time, we had to explore the whole city and I must say, the city is also very interesting from the historical point of view so we admired both historical sights and a wonderful nature.

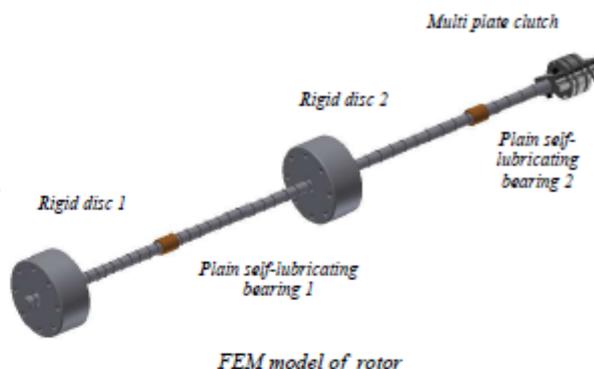
In the end, I have to mention that it was an amazing experience for me which has changed me and has inspired me because, now I am sure, I would love to attend some foreign University in the future. Nevertheless, I am glad that I had an opportunity to get know new places and meet new friends.



KINEMATIC EXCITATION OF THE ROTOR

INTRODUCTION

The work deals with rotor dynamics problem. Dynamic response of rotor with kinematically excited support is investigated. The studied case can represent for example a turbocharger that is component of an engine. Vibration of the engine is transported to the rotor of turbocharger through bearings. The finite element method model was prepared and results were validated using MSC.Adams software. The finite element method describes the shaft, the disc is assumed to be rigid. The complete model of rotot with discs and bearings is studied, including modal analysis and simulation of motion. All computation is performed using the math software Scilab. The current work concentrates on problems which arise when body rotates. Therefore, the physical model considers internal material damping and gyroscopic effect. The most important phenomenon in rotor dynamics is non-constant critical speed and area of instability.

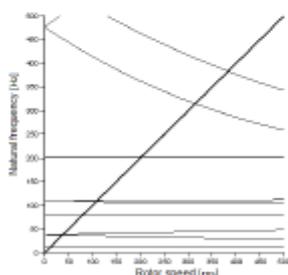


NUMERICAL SIMULATION

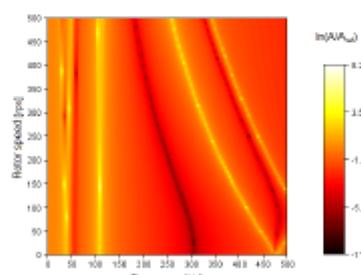
The rotor is described using the finite element method in Scilab. Only beam elements are used. The obtained results were compared with those of solid FEM model in NASTRAN software. During this tuning stage, only static analysis was performed. Simulation in Scilab was preceded by such tuning procedure. The numerical experiments the speed range from 0 to 500 rps was considered. The frequency of kinematic excitation can be arbitrary, but only the range from 0 to 500 Hz was studied.

Our contribution divides into three parts:

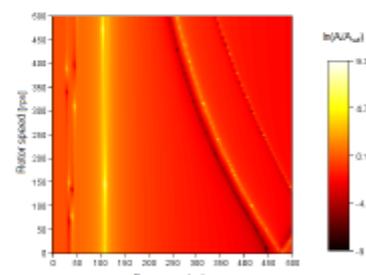
- The first part of work describes finite element model of rotor.
- Next, the natural frequencies and stability of rotor are studied.
- The last part is devoted to the simulation of motion and comparing all results.



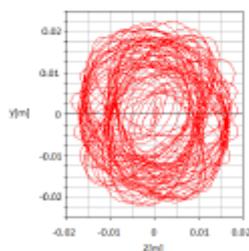
Campbell diagram



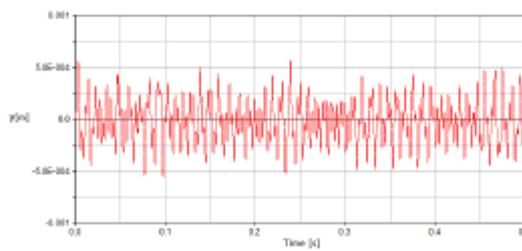
Transfer function of disc 1



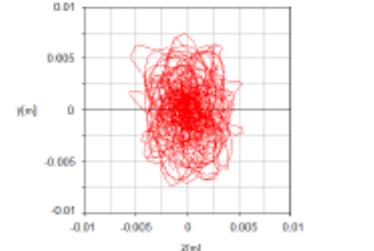
Transfer function of disc 2



Disc 1 - 180 [rpm], 110 [Hz], 0.001 [m]



Disc 1 - 180 [rpm], 250 [Hz], 0.001 [m]



Disc 2 - 180 [rpm], 110 [Hz], 0.001 [m]

CONCLUSION

The response of disc in radial displacement for a different rotor speed and different frequency vibration of support is displayed in transfer function. The area of resonance is yellow and the area of antiresonance is black. Resonance and antiresonance are next to each other somewhere and it is very interesting result. Resonance can be like forward precession (FP) or backward precession (BP). The value of displacement is in logarithmic value, "A" is amplitude of motion of disc, "A_{ref}" is amplitude of kinematic excitation. MSC.Adams confirmed the results in simulation experiment. The work confirmed the effect of kinematic excitation. This effect causes that it can be danger for working of equipment when the vibration has the same value like a resonance of the rotor.

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