Design, Model, Manufacture and Test a Parallel MMR

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Aim of the Project

The Aim of the project is to design, model, manufacture and test a parallel MMR to replace the inline MMR used in a prior project.

Background

A mechanical motion rectifier is a piece of machinery which converts bilateral rotation into uni-directional rotation. The project is based on comparing a parallel MMR to an in-line MMR which was used in the group project. The MMR is one of the main components in the scaled down rig. In the rig also there is a motor to simulated the energy of the waves, a gearbox and a flywheel to count the number of revolutions that is generated by each MMR

Limerick Wave

The project has been derived from years of work carried out be Limerick Wave Co, which has engineered the original type of MMR used in this project. The aim of Limerick Wave is to harvest the energy generated by waves. As there is no limit on the amount of energy to be generated, it is an untapped source. As we move to a more environmentally conscious world, this type of research and engineering has become ever so more important.

Types of MMR

There are several types of mechanical motion rectifiers that have been designed. Some of these include the parallel MMR, inline MMR, and a rack and pinion MMR.

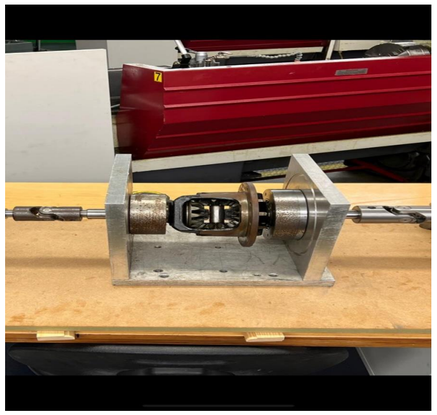

Figure 1: In-line MMR used in prior work

Figure 2: Parallel MMR

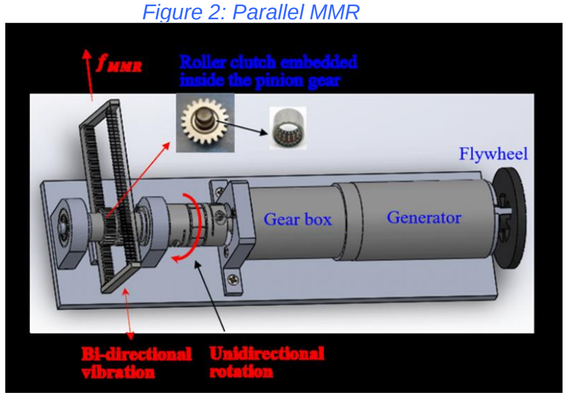

Figure 3 : Rack and Pinion MMR

Design and Modelling

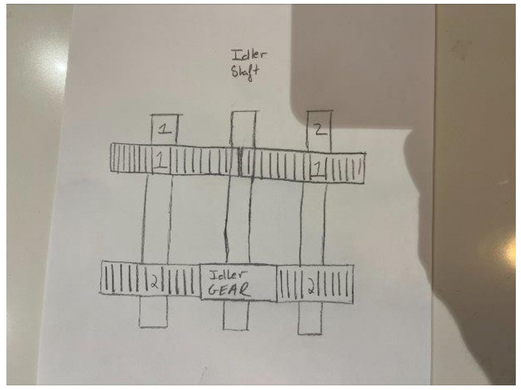

Photo of: Sketch of parallel MMR

In the design above there are five gears, three shafts and several bearings. One of these bearings is a one way bearing and this is an important part of the working of the MMR. As the input shaft is rotated clockwise, the output shaft will also turn clockwise, but as the input shaft is rotated anti-clockwise the output shaft will remain turning clockwise. This is due to setup of the gearing and the one way bearing as it only allows for the output shaft to rotate clockwise.

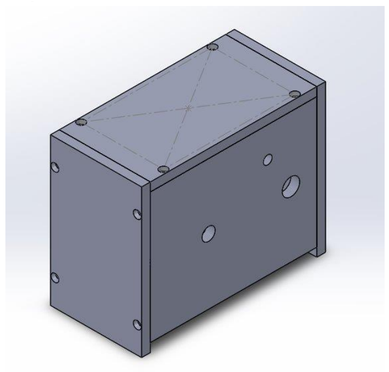

Photo of: Model of housing for in-line MMR

The housing of the in-line MMR was modelled on SolidWorks, the housing itself is made from 10mm mild steel. To allow for the internal gears to work smoothly, internally is covered in grease

Conclusion

In the testing phase of this project, the in-line MMR was compared against the parallel MMR. The objective was to count the number of revolutions of the flywheel of the two MMRs over several test's and record the results. The only change in the two tests was the MMR to be used. The input conditions were the same and this was controlled using a plc with a program created by the electronic engineering department. The operation of the in-line MMR was noted to be a lot smoother as the parallel MMR was rough on the change of direction of the input shaft. The in-line was smoother due to the change in direction being the same axis.

Results

Photo of: Rig with parallel MMR implemented.

References

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