Spanish scientists are working on mechanical transmission without contact between parts

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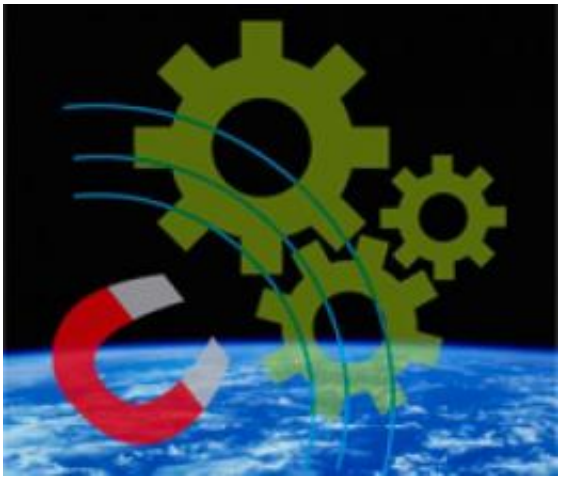

This image shows a representation of the system moving gears without friction. Credit: UC3M

Researchers at Universidad Carlos III de Madrid are coordinating an international project to develop a new concept of mechanical transmission without contact between parts, based on magnetic forces, which prevents friction and wear as well as making lubrication of the parts unnecessary.

The objective of project MAGDRIVE is to define, construct, and test a prototype of mechanical transmission without contact between parts, which is capable of functioning in cryogenic conditions with minimum practically non-existent maintenance. "In addition, this type of

mechanism, which is responsible for transmitting power between various elements within a machine, should be capable of going into space and being in operation for years without any type of breakdown or some similar event", explained Professor José Luis Pérez Díaz from the UC3M Department of Mechanical Engineering, who is the coordinator this new European research project for the 7th Framework Program (FP7), set to last for three years. The fundamental features of the design, proposed by the researchers to ensure that there is no physical contact between the transmission movable parts, are based on the use of magnetic forces. "What we are attempting to research within the framework of this project is if the efficiency of these mechanisms is adequate and if they have the properties which we think they should have", Professor Pérez Díaz clarified.

The advantages of mechanical transmission in which there is no contact between the moving parts, are mainly, first, that wear and tear of the parts is prevented, and second, that lubrication is not necessary. "Not having contact or friction between the teeth of the gears", Perez Díaz explained, "means it would not be necessary to use lubricants. At cryogenic temperatures - around -200 ºC - conventional lubricants become hard as a rock and cause problems", he commented. "Furthermore", he pointed out, "if we take into account that more than half of the energy that we consume is lost to friction, having mechanisms that do not do so would be truly important".

The utility of this type of mechanical transmission model can found in diverse scenarios. The first application the researchers commented on is for all types of mechanisms used in satellites or spacecrafts where there is not easy access for maintenance and where it is necessary to have a low weight and to function under the cryogenic conditions of space, although applications can be found in instruments that need to function within this range of temperature on earth, such as a CT and MRI machines used in medicine. "If our type of transmission can be

extrapolated to atmospheric temperature it could be utilized in any transmission system which could take advantage of these properties, although at the moment we are focussing on the space application", according to Professor Pérez Díaz, He also forms part of the MAQLAB research group at the UC3M, which has experience working in magneto mechanics and superconducting levitation mechanics.

The MAGDRIVE project is a European project in the Space area of the 7th Framework Program coordinated by Universidad Carlos III de Madrid (UC3M) and with the participation of the National Research Council (CNR-SPIN) of Genova and the University of Cassino (both in Italy), the Foundation of the School of Sciences at the University of Lisbon (Portugal) and three companies: BPE from Germany, the Spanish LIDAX, and CAN Superconductors from the Czech Republic. UC3M, in addition to the coordination tasks, will carry out the design and a large part of setting up the prototype, in addition to participating in the tests, according to the project heads.

Provided by Carlos III University of Madrid

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