

HarmLES

Dry lubricated Harmonic Drives for space applications

LESS MASS FOR MORE SPACE

In space mass equals cost, so lower mass means lower cost. The HarmLES project takes on the challenge of developing critical technologies aimed at bringing down the cost and mass of spacecraft.

When Solar Arrays or antennas on spacecraft have to be moved into the right position, and kept there for prolonged periods of time, Harmonic drives are needed. The design and composition of these drives is paramount for the impact they have on the global spacecraft mass. The trend goes for smaller drives, and in this respect, the development of new solid lubricating coatings are needed for harmonic drives. The HarmLES project takes on this challenge.

Further to mass reduction, a major impact of this project is European non-dependence in this area of critical space technologies. Indeed, should HarmLES prove successful, Europe has the potential to obtain world-wide leadership in this technology field. In financial terms, reducing spacecraft mass leads to a strong reduction of launch costs - for a typical satellite with 2-4 units, a cost reduction of EUR 50.000 would be feasible. Lower costs of

satellites for Earth observation programs would provide for enhanced usage of such means for better monitoring of essential climate variables (ECV), and other applications such as monitoring of deforestation.

The use of Harmonic Drives is presently limited by the need of grease lubrication. In space, greases are linked to the risk of outgassing, contamination of other parts of a spacecraft and such gasses also limit the usage under certain temperatures. The use of solid lubricants overcomes all these limits. However, the first trials to apply conventional solid lubricating coatings - partially used in space bearings - did not lead to success in harmonic gears, due to the strongly differing mechanical and contact situation. Therefore, project HarmLES seeks to enhance this record, as it will focus on the development of solid lubricant coatings for Harmonic Drives in space.



ERNST JANOTKA
IS PROJECT COORDINATOR



© HarmLES

HarmLES will develop new solid lubricating coatings for harmonic drives.

QUESTIONS & ANSWERS

What do you want to achieve with this project?

New dry lubricant coatings shall be developed especially for harmonic drives. This would enable to use harmonic drives in much more applications than now and would reduce mass of satellites, and therefore launch costs.

Why is this project important for Europe?

One main European strategy is "non-dependence". US-suppliers export can be blocked by ITAR-regulations, which is a permanent danger to European space activities. Moreover, if the project is successful, Europe would reach world-wide leadership in this specific product.

How does your work benefit European citizens?

Strengthening European space industry secures employment in Europe. Lower costs of satellites for Earth observation improves climate control, forest health, etc. This product may also reduce the need of cooling lubricants in machining.

HarmLES

Dry lubricated Harmonic Drives for space applications



LIST OF PARTNERS

- Austrian Center of Competence for Tribology (AC2T); Austria
- Aerospace and Advanced Composites (AAC), Austria
- Harmonic Drive AG, Germany
- Fundacion Tecnalia Research & Innovation, Spain

COORDINATOR

**Austrian Center of Competence for Tribology
(AC2T), Austria**

CONTACT

Ernst JANOTKA

Tel: +43 2622 81600 215

E-mail: Janotka@ac2t.at

Andreas MERSTALLINGER

Scientific Coordinator

Tel: +43 2622 90550 300

E-mail: andreas.merstallinger@aac-research.at

PROJECT INFORMATION

Dry lubricated Harmonic Drives for space applications
(HarmLES)

Contract no: 263162

Duration: 36 months

EU Contribution: € 1.166.833

Estimated total cost: € 1.695.464

