**Replacement of hydrazine for orbital and launcher propulsion systems**

**Rheform at a Glance**

**Rheform** aims at replacing the carcinogenic and toxic hydrazine in propulsion applications  
**Rheform**’s consortium consists of 9 entities from Austria, France, Germany and Sweden  
**Rheform** will run from January 2015 to December 2017  
**Rheform** has received funding from the European Union’s Horizon 2020 research innovation programme under grant agreement No 640376

**Coordination**

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Rheform - Objectives

Rheform aims at developing technologies which will enable the replacement of hydrazine with green propellants based on ammonium dinitramide (ADN). The substitution of hydrazine with green propellants may lead to significant advantages compared to hydrazine:

- Lower overall life cycle cost due to simplified handling, especially at the launch site.
- Higher overall performance (higher specific impulse, i.e. more thrust per kg of mass of propellant burned)
- Higher density leading to smaller tanks, and therefore reduced structural weight.

The three main objectives of the project are:
1. Adaptation of existing ADN-based propellants (LMP-103S and FLP-106) to obtain a combustion temperature compatible with currently existing materials available in Europe (ITAR-free)
2. Development of a cold-start capable ignition system based on:
   - catalytic ignition
   - thermal ignition
3. Verification of the technologies developed within thruster demonstrators. Such units will reach a Technology Readiness Level of 5

Why Replace Hydrazine?

Hydrazine and its derivatives have been the standard for spacecraft propulsion system since the 1960s. These propellants are highly toxic and carcinogenic, increasing the complexity and cost of testing, shipping, handling and launch preparation. In 2011 hydrazine was added to the candidate list of substances of very high concern (SVHC) by Europe’s Registration Evaluation Authorisation and Restriction of Chemicals (REACH). Both NASA and ESA are considering restriction or prohibition of the use of hydrazine in the near to mid-term.

The PRISMA satellite, launched in 2010, provided a direct comparison of hydrazine and LMP-103S, the ADN-based propellant developed by ECAPS. The two images clearly show how the use of LMP-103S simplifies the tanking procedure.