FWO DMP Template - Flemish Standard Data Management Plan

Project supervisors (from application round 2018 onwards) and fellows (from application round 2020 onwards) will, upon being awarded their project or fellowship, be invited to develop their answers to the data management related questions into a DMP. The FWO expects a **completed DMP no later than 6 months after the official start date** of the project or fellowship. The DMP should not be submitted to FWO but to the research co-ordination office of the host institute; FWO may request the DMP in a random check.

At the end of the project, the **final version of the DMP** has to be added to the final report of the project; this should be submitted to FWO by the supervisor-spokesperson through FWO's e-portal. This DMP may of course have been updated since its first version. The DMP is an element in the final evaluation of the project by the relevant expert panel. Both the DMP submitted within the first 6 months after the start date and the final DMP may use this template.

The DMP template used by the Research Foundation Flanders (FWO) corresponds with the Flemish Standard Data Management Plan. This Flemish Standard DMP was developed by the Flemish Research Data Network (FRDN) Task Force DMP which comprises representatives of all Flemish funders and research institutions. This is a standardized DMP template based on the previous FWO template that contains the core requirements for data management planning. To increase understanding and facilitate completion of the DMP, a standardized **glossary** of definitions and abbreviations is available via the following link.

1. General Project Information	
Name Grant Holder & ORCID	Joren Malfroy 0000-0002-6487-014X
Contributor name(s) (+ ORCID) & roles	Promotor: Dirk Vandepitte 0000-0003-0978-3315 Co-promotor: Johan Steelant 0000-0003-1811-9002
Project number[1] & title	3E220444 Conformable Pressurized Tanks for Hydrogen Storage and Transportation
Funder(s) GrantID[2]	1SG1523N
Affiliation(s)	KU Leuven
Please provide a short project description	The conformable concept significantly improves the volumetric efficiency of a pressure vessel compared with traditional stacks of cylindrical pressure vessels. The addition of a tapering degree of freedom enlarges the design space with an even further increase of volumetric efficiency. This project develops a comprehensive modelling approach of tapered conformable pressurized tanks for hydrogen storage taking into account all mechanical, thermal and cyclic loads which may be present at both low and high differential pressure. A constrained optimization problem is defined with the objectives to minimize weight and to maximize volumetric efficiency, including both concave and convex contours and with a wide range of aspect ratios. Designs for storage of liquid hydrogen as well as compressed gaseous hydrogen are optimized through analytical and finite element models of the stress distribution in the thin-walled or thick-walled shell of the conformable tank. Exploiting the high structural efficiency of axi-symmetric pressure vessels, the first step is the modelling of tapered conformable tanks using only axi-symmetrical primary structures for a given pressurization in conjunction with different stress and strain constraints. After the feasibility of the conformable concept is proven from a geometrical and structural perspective, initial investigations are conducted on the temperature distributions in the tank and its manufacturability.

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[1] "Project number" refers to the institutional project number. This question is optional since not every institution has an internal project number different from the GrantID. Applicants can only provide one project number.
[2] Funder(s) GrantID refers to the number of the DMP at the funder(s), here one can specify multiple GrantIDs if multiple funding sources were used.

2. Research Data Summary

List and describe all datasets or research materials that you plan to generate/collect or reuse during your research project. For each dataset or data type (observational, experimental etc.), provide a short name & description (sufficient for yourself to know what data it is about), indicate whether the data are newly generated/collected or reused, digital or physical, also indicate the type of the data (the kind of content), its technical format (file extension), and an estimate of the upper limit of the volume of the data[3].

				ONLY FOR DIGITAL DATA	*ONLY FOR DIGITAL DATA*	*ONLY FOR DIGITAL DATA*	*ONLY FOR PHYSICAL DATA*
Dataset Name	Description	New or Reused	Digital or Physical	Digital Data Type	Digital Data Format	Digital Data Volume (MB, GB, TB)	Physical Volume
Finite element analysis simulations	Simulations run in Siemens NX	New	Digital	Simulation data	.prt, .fem, .sim, .op2, .csv	< 1 TB	NA
Analytical computations	Computations run in MATLAB	New	Digital	Computational data	.m, .mat, .eps	< 10 GB	NA

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[3] Add rows for each dataset you want to describe.

If you reuse existing data, please specify the source, preferably by using a persistent identifier (e.g. DOI, Handle, URL etc.) per dataset or data type.	NA
Are there any ethical issues concerning the creation and/or use of the data (e.g. experiments on humans or animals, dual use)? If so, please describe these issues further and refer to specific datasets or data types when appropriate.	☐ Yes, human subject data ☐ Yes, animal data ☐ Yes, dual use ☒ No

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[4] These data are generated by combining multiple existing datasets.

Will you process personal data[5]? If so, briefly describe the kind of personal data you will use. Please refer to specific datasets or data types when appropriate. If available, add the reference to your file in your host institution's privacy register.	☐ Yes ☒ No
Does your work have potential for commercial valorization (e.g. tech transfer, for example spin-offs, commercial exploitation, …)? If so, please comment per dataset or data type where appropriate.	☒ Yes ☐ No Meetings with the Intellectual Property Unit of KU Leuven Research & Development (LDR) will be arranged to discuss the process of protecting intellectual property and how it is applicable to research about conformable pressurized tank for hydrogen storage.
Do existing 3rd party agreements restrict exploitation or dissemination of the data you (re)use (e.g. Material/Data transfer agreements, research collaboration agreements)? If so, please explain to what data they relate and what restrictions are in place.	☐ Yes ☒ No
Are there any other legal issues, such as intellectual property rights and ownership, to be managed related to the data you (re)use? If so, please explain to what data they relate and which restrictions will be asserted.	☐ Yes ☒ No

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[5] See Glossary Flemish Standard Data Management Plan

3. Documentation and Metadata	
Clearly describe what approach will be followed to capture the accompanying information necessary to keep **data understandable and usable**, for yourself and others, now and in the future (e.g. in terms of documentation levels and types required, procedures used, Electronic Lab Notebooks, README.txt files, Codebook.tsv etc. where this information is recorded).	Computational data is accompanied by: (1) a README.txt file explaining the code's purpose, inputs, outputs, structure of the generated data, connection to other files and assumptions, (2) comments throughout the code for clarification and (3) units and a brief explanation placed after the declaration of each variable. Simulation data is accompanied by: (1) a README.txt file explaining the simulation purpose, CAD model properties (shape and dimensions), finite element model properties (element type, size and material) and simulation model properties (loads and constraints) and (2) appropriate naming of materials, loads, constraints, mesh collectors, groups of nodes, simulation objects and solutions throughout the simulation files.
Will a metadata standard be used to make it easier to **find and reuse the data**? If so, please specify which metadata standard will be used. If not, please specify which metadata will be created to make the data easier to find and reuse. *REPOSITORIES COULD ASK TO DELIVER METADATA IN A CERTAIN FORMAT, WITH SPECIFIED ONTOLOGIES AND VOCABULARIES, I.E. STANDARD LISTS WITH UNIQUE IDENTIFIERS.*	☐ Yes ☒ No To the researcher's knowledge there is no formally acknowledged metadata standard in the context of conformable pressurized tanks. Therefore, it will be ensured that all metadata are described consistently throughout the project and are well documented.

4. Data Storage & Back-up during the Research Project	
Where will the data be stored?	All datasets are version controlled and stored in OneDrive. The choice for OneDrive is made because the project does not involve sensitive personal data and to facilitate collaboration, should an opportunity present itself. The datasets are also stored on the researcher's computer hard drive. This hard copy serves as an easy access alternative for instances when there is no (secure) internet connection.
How will the data be backed up? *WHAT STORAGE AND BACKUP PROCEDURES WILL BE IN PLACE TO PREVENT DATA LOSS? DESCRIBE THE LOCATIONS, STORAGE MEDIA AND PROCEDURES THAT WILL BE USED FOR STORING AND BACKING UP DIGITAL AND NON-DIGITAL DATA DURING RESEARCH.[6]* *REFER TO INSTITUTION-SPECIFIC POLICIES REGARDING BACKUP PROCEDURES WHEN APPROPRIATE.*	OneDrive as a storage location has adequate backup strategies in place. The risks and loss of time associated with data loss or damage are mitigated by the use of multiple storage locations (OneDrive and hard drive).
Is there currently sufficient storage & backup capacity during the project? If yes, specify concisely. If no or insufficient storage or backup capacities are available, then explain how this will be taken care of.	☒ Yes ☐ No The researcher's computer hard drive and Onedrive have a storage space of 1 TB and 2 TB, respectively.

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[6] Source: Ghent University Generic DMP Evaluation Rubric: https://osf.io/2z5g3/

How will you ensure that the data are securely stored and not accessed or modified by unauthorized persons? *CLEARLY DESCRIBE THE MEASURES (IN TERMS OF PHYSICAL SECURITY, NETWORK SECURITY, AND SECURITY OF COMPUTER SYSTEMS AND FILES) THAT WILL BE TAKEN TO ENSURE THAT STORED AND TRANSFERRED DATA ARE SAFE.* [6]	All generated data is stored securely on KU Leuven's servers (OneDrive) and behind proper authentication. During the project, the researcher and the promotor will evaluate how and when to share data. Sharing of data will occur through a secure channel such as Belnet Filesender.
What are the expected costs for data storage and backup during the research project? How will these costs be covered?	Data storage costs on OneDrive and hard drive capacity on the research laptop are covered by the internal ICT contributions.

5. Data Preservation after the end of the Research Project	
Which data will be retained for at least five years (or longer, in agreement with other retention policies that are applicable) after the end of the project? In case some data cannot be preserved, clearly state the reasons for this (e.g. legal or contractual restrictions, storage/budget issues, institutional policies...).	All datasets related to publications are stored in the KU Leuven Research Data Repository (RDR). The data within the RDR are openly available and linked to the publications through Lirias, ORCID and ResearchGate to maximize dissemination.
Where will these data be archived (stored and curated for the long-term)?	The retained data is archived in the KU Leuven RDR.
What are the expected costs for data preservation during the expected retention period? How will these costs be covered?	The amount of preserved data is expected to not exceed 50 GB per year. This amount of storage on the KU Leuven RDR is covered by the internal ICT contributions.

6. Data Sharing and Reuse	
Will the data (or part of the data) be made available for reuse after/during the project? Please explain per dataset or data type which data will be made available. *Note that 'available' does not necessarily mean that the data set becomes openly available, conditions for access and use may apply. Availability in this question thus entails both open & restricted access. For more information: https://wiki.surfnet.nl/display/standards/info-eu-repo/#infoeurepo-AccessRights*	☒ Yes, in an Open Access repository ☐ Yes, in a restricted access repository (after approval, institutional access only, …) ☐ No (closed access) ☐ Other, please specify:
If access is restricted, please specify who will be able to access the data and under what conditions.	The data will be made available as open access. Therefore, it will be available to anyone for any purpose, provided that they give appropriate credit to the creators.
Are there any factors that restrict or prevent the sharing of (some of) the data (e.g. as defined in an agreement with a 3rd party, legal restrictions)? Please explain per dataset or data type where appropriate.	☐ Yes, privacy aspects ☐ Yes, intellectual property rights ☐ Yes, ethical aspects ☐ Yes, aspects of dual use ☐ Yes, other ☒ No
Where will the data be made available? If already known, please provide a repository per dataset or data type.	The data will be deposited in the KU Leuven Research Data Repository (RDR).

When will the data be made available? *THIS COULD BE A SPECIFIC DATE (DD/MM/YYYY) OR AN INDICATION SUCH AS 'UPON PUBLICATION OF RESEARCH RESULTS'.*	Upon publication of the research results.
Which data usage licenses are you going to provide? If none, please explain why. *A DATA USAGE LICENSE INDICATES WHETHER THE DATA CAN BE REUSED OR NOT AND UNDER WHAT CONDITIONS. IF NO LICENCE IS GRANTED, THE DATA ARE IN A GREY ZONE AND CANNOT BE LEGALLY REUSED. DO NOTE THAT YOU MAY ONLY RELEASE DATA UNDER A LICENCE CHOSEN BY YOURSELF IF IT DOES NOT ALREADY FALL UNDER ANOTHER LICENCE THAT MIGHT PROHIBIT THAT.* *EXAMPLE ANSWER: E.G. "DATA FROM THE PROJECT THAT CAN BE SHARED WILL BE MADE AVAILABLE UNDER A CREATIVE COMMONS ATTRIBUTION LICENSE (CC-BY 4.0), SO THAT USERS HAVE TO GIVE CREDIT TO THE ORIGINAL DATA CREATORS." [7]*	Data from the project that can be shared will be made available under a Creative Commons Attribution license, so that users have to give credit to the original data creators.
Do you intend to add a PID/DOI/accession number to your dataset(s)? If already available, please provide it here. *INDICATE WHETHER YOU INTEND TO ADD A PERSISTENT AND UNIQUE IDENTIFIER IN ORDER TO IDENTIFY AND RETRIEVE THE DATA.*	☐ Yes ☒ No
What are the expected costs for data sharing? How will these costs be covered?	The cost for data sharing in the RDR are covered by the institution's internal ICT contributions. If publishers require datasets to be stored elsewhere, related costs are expected to be marginal since individual publications are not accompanied by very large amounts of data (expected <10 GB per publication). These costs will then be covered by the project's consumable budget.

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[7] Source: Ghent University Generic DMP Evaluation Rubric: https://osf.io/2z5g3/

7. Responsibilities	
Who will manage data documentation and metadata during the research project?	The researcher is responsible for datasets with proper metadata.
Who will manage data storage and backup during the research project?	The researcher is responsible for data storage & backup during the project.
Who will manage data preservation and sharing?	The researcher is responsible for ensuring data preservation and reuse.
Who will update and implement this DMP?	The researcher bears the end responsibility of updating & implementing this DMP.