

Project: 1173 Issue: 3  
Contractant: ESA Date: 07.04.2020  
Contract No.: 4000126210/18/NL/AR/va  
Contract title: Material Characterization Service Efficiency Increasing

**Executive Summary Report  
Material Characterization  
Service Efficiency Increasing**

Nico Pouvesle  
prepared by

07.4.2020  
Date

*N. Pouvesle*  
Signature

Federico Zühlke  
approved by

07.04.2020  
Date

*FZ*  
Signature

ESA STUDY CONTRACT REPORT			
ESA CONTRACT No <b>4000126210/18/NL/AR/va</b>	SUBJECT <b>Final Report</b>  Document No.: <b>ET-ESR-20-1173-0</b>		CONTRACTOR ET GmbH Brunthal
* ESA CR( )No	* STAR CODE		
ABSTRACT:			
<p>The already operating material characterization service at ET enables material testing under conditions down to 20 K in original cryogenic fluids (especially liquid hydrogen). The capacity is limited by the turnaround time caused by temperature and safety issues. For example, a standard LH2 tensile test takes about three hours to complete, allowing only two experiments to be carried out in an 8-hours long working day</p> <p>The main objective of the activity was to reduce the turnaround time significantly to allow a higher number of tests to be performed per working day.</p> <p>The straightforward way to optimize the turnaround times of the different test methods and campaigns was to work on three activities:</p> <ul style="list-style-type: none"> <li>Shortening the warm-up time of the test apparatus after cryogenic testing</li> <li>Improving the tools and the components of the test machine in order to reduce set-up and disassembly time</li> <li>Addressing methods for process automatization</li> </ul> <p>The results were implemented and the facility revised. The main targets of the activity, to improve of 30% the setup times and of 50% the warm-up time were met. The resulting turnaround time for a standard tensile test in LH2 is now about two hours, allowing four tests to be performed per working day.</p>			
<p>The work described in this report was done under ESA contract.            Responsibility for the contents resides in the author or organization that prepared it.</p>			
<b>Name of author:</b> <b>Mr. Pouvesle</b>			
<b>** NAME OF ESA STUDY MANAGER</b> <b>Mr. Nathan Bamsey</b> <b>DIV: TEC-MSP</b> <b>DIRECTORATE: D\TEC</b>		<b>** ESA BUDGET HEADING</b>	

### Internal distribution

Name	Organisation	Number of Copies	For		
			Approval	Acceptance	Information
Federico Zühlke	Engineering	1	X		
Dr. Nicolas Pouvesle	Engineering Manager	1			X
Dr.-Ing. Federico Botteghi	Engineering	1			X
Dr. Bernhard Strauss	Project Manager	1	X		

### External distribution

Name	Companies	Number of Copies	For		
			Approval	Acceptance	Information
Mr Nathan Bamsey	ESTEC	1		X	
Mr Vasileios Angelopoulos	ESTEC	1		X	

### Status of Issues and Revisions

Issue Index	Date of Issue	Description
1	27.03.2020	Initial issue
2	06.04.2020	Comments of ESTEC (E-Mail from Bamsey 02.04.2020)

# Executive summary report

---

The already operating material characterization service at ET enables material testing under conditions down to 20 K in original cryogenic fluids (especially liquid hydrogen). The capacity is limited by the turnaround time caused by temperature and safety issues. For example, a standard LH2 tensile test takes about three hours to complete, allowing only two experiments to be carried out in an 8-hours long working day

The main objective of the activity was to reduce the turnaround time significantly to allow a higher number of tests to be performed per working day.

The straightforward way to optimize the turnaround times of the different test methods and campaigns was to work on three activities:

- Shortening the warm-up time of the test apparatus after cryogenic testing
- Improving the tools and the components of the test machine in order to reduce set-up and disassembly time
- Addressing methods for process automatization

The results were implemented and the facility revised. The main targets of the activity, to improve of 30% the setup times and of 50% the warm-up time were met. The resulting turnaround time for a standard tensile test in LH2 is now about two hours, allowing four tests to be performed per working day.