

Sub-project proposal

TN02000069

Project of the 2nd Public Competition of the National Centres of Competence Programme

General

Project name	NCK MATCA		
Sub-project order number	/019		
Sub-project name	Research and Development of a Heat Exchanger for Traction		
Sub-project identification code	TN02000069/019		
Commencement date of the sub-project	month	january	year 2026
Completion date of the sub-project	month	december	year 2028
Date of approval of the sub-project by the Council of the Centre	17.12.2025		

Brief summary of the sub-project (SP)

Sub-project justification

The project is focused on research, development and experimental verification of additively manufactured heat exchanger for traction batteries of electric vehicles. It is based on complementary cooperation between NCK MATCA and P3DT centres, whose common goal is to increase specific heat transfer at minimum pressure loss while respecting the limitations of additive manufacturing technologies with regard to installation limits in the automotive sector.

The project uses synergy of competencies of both centres in the fields of 3D printing, topological optimization, numerical simulation and material engineering. The key technology platform is SLM (Selective Laser Melting), which allows the production of highly accurate and geometrically complex metal parts from aluminium alloys. These materials are characterized by low weight, high thermal conductivity and excellent mechanical properties, making them an ideal choice for traction battery heat exchangers.

Commercialization

DP outputs will provide data and procedures for incorporation of additively manufactured heat exchangers into BTMS traction batteries under automotive development conditions. Based on them, it will be possible to prepare pilot deployment in the development of partner Škoda Auto and to decide on the optimal path to the application (material selection, part segmentation, process parameters). The project will expand knowledge and recommendations in the field of design for Additive Manufacturing (DFAM). The involvement of Škoda Auto will ensure the assessment of results according to real installation and acceptance criteria, following both automotive development and serial production. Expected benefits include more compact and lighter exchangers with higher specific heat transfer at limited pressure loss and shortening of the development cycle thanks to portable design procedures. From the market point of view, the project creates know-how for further cooperation with both Škoda Auto and Tier-1 suppliers in the growing BTMS segment, in the form of joint development and knowledge transfer, thus strengthening the readiness for future demand. Furthermore, it opens up application possibilities to other market segments using battery storage requiring efficient cooling.

Aim of the sub-project

The main objective of DP is the research, development and experimental verification of additively manufactured heat exchanger for traction batteries of vehicles with higher specific heat transfer at limited pressure loss.

Partial objectives of DP:

- Mapping of 3D structured geometries for effective heat dissipation in traction batteries with respect to additive production limitation and installation limits.
- Design and additive production of a functional sample of aluminium alloy heat exchanger and verification of their thermal and hydraulic properties in laboratory conditions against the reference solution.
- Topological and parametric optimization of the heat exchanger with the aim to maximize specific heat transfer while minimizing pressure loss and respecting production limits.
- Coordination and sharing of know-how between NCK consortium partners MATCA, FZU, BaL, CARDAM and UPOL and partners of the cooperating consortium P3DT - TUL and Škoda Auto in the field of additive manufactured heat exchangers for traction batteries (requirements, interfaces, installation conditions and operating profiles).

Participants involved

1.	Fyzikální ústav AV ČR, v.v.i.
2.	CARDAM s.r.o.
3.	Beneš a Lát, a.s.
4.	Univerzita Palackého v Olomouci
5.	Participant name
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39.	Participant name
40.	Participant name

Branches involved

1.	Fyzikální ústav AV ČR, v.v.i. - Na Slovance
2.	CARDAM s.r.o.
3.	Beneš a Lát, a.s.
4.	Oddělení: Experimentální fyziky
5.	Branch name
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Outcomes of the sub-project

Identification code	Name	Completion date		Type	Description	Market application
		Month	Year			
TN02000069//019-V01	Functional sample of thin-walled 3D printed part made of new aluminium alloy with ideal slim ratio	april	2027	Gfunk - functional sample	Functional sample of the 3D printed component containing elements of the development of the print parameters of the newly selected aluminium alloy, optimization of the print parameters for the final application on the samples with achieving the maximum ratio of mechanical properties and the lowest possible wall thickness. Including comparison with the commercially available AlSi10Mg aluminium alloy.	This result will validate the concept and provide measurable data for the design of complex heat exchangers. The irradiation will provide knowledge of the processing of new or previously 3D printing technologies of unprocessed alloys that can be offered for further 3D printing applications.
TN02000069//019-V02	Functional sample of heat exchanger assembly	may	2028	Gfunk - functional sample	A scaled-down model of a complex heat exchanger for initial tests from a new alloy using developed print parameters, topological optimization and finally selected structures for efficient cooling.	The result will verify the applicability of 3D printed heat exchangers for efficient cooling of traction batteries, but it will also be possible to use it as a model design for other cooling segments using battery but also other power source.
TN02000069//019-V03	Functional heat exchanger sample for testing in traction battery	december	2028	Gfunk - functional sample	Final functional sample intended for installation in traction battery and verification in system. An assembly of exchangers under one module of traction battery Škoda Auto integrated into traction battery is assumed.	The result demonstrates the installation of a heat exchanger in a traction battery and provides background for further industrial development. The result will serve as a reference sample for downstream joint R&D projects and transfer of know-how.
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Financial plan

		TOTAL						
AR	%				60	50	40	
ED	%				40	50	60	
Checksum AR/ED		Not 100%	Not 100%	Not 100%	OK	OK	OK	
		2023	2024	2025	2026	2027	2028	TOTAL
Personnel costs	CZK	0	0	0				18 200 000
Subcontracting costs	CZK	0	0	0				
Other direct costs	CZK	0	0	0				
Intellectual property costs	CZK	0	0	0				
Rest of direct costs	CZK	0	0	0				
Indirect costs	CZK	0	0	0				
Total costs	CZK	0	0	0				18 200 000
Support	CZK	0	0	0				11 640 000
Other resources	CZK	0	0	0				6 560 000
Level of support	%	#DĚLENÍ_NULOU!	#DĚLENÍ_NULOU!	#DĚLENÍ_NULOU!				64
Total resources	CZK	0	0	0				18 200 000

		Fyzikální ústav AV ČR, v.v.i.						
		2023	2024	2025	2026	2027	2028	TOTAL
Personnel costs	CZK							
Subcontracting costs	CZK							
Other direct costs	CZK	0	0	0				
Intellectual property costs	CZK							
Rest of direct costs	CZK							
Indirect costs	CZK							
Proportion of indirect costs	%	#DĚLENÍ_NULOU!	#DĚLENÍ_NULOU!	#DĚLENÍ_NULOU!				
Total costs	CZK	0	0	0				
Support	CZK							
Other resources	CZK							
Level of support	%	#DĚLENÍ_NULOU!	#DĚLENÍ_NULOU!	#DĚLENÍ_NULOU!				
Checking the amount of resources		Resources correspond to total costs	Resources correspond to total costs	Resources correspond to total costs	Resources correspond to total costs	Resources correspond to total costs	Resources correspond to total costs	

		CARDAM s.r.o.						
		2023	2024	2025	2026	2027	2028	TOTAL
Personnel costs	CZK							
Subcontracting costs	CZK							
Other direct costs	CZK	0	0	0	0			
Intellectual property costs	CZK							
Rest of direct costs	CZK							
Indirect costs	CZK							
Proportion of indirect costs	%	#DĚLENÍ_NULOU!	#DĚLENÍ_NULOU!	#DĚLENÍ_NULOU!	#DĚLENÍ_NULOU!			
Total costs	CZK	0	0	0	0			
Support	CZK							
Other resources	CZK							
Level of support	%	#DĚLENÍ_NULOU!	#DĚLENÍ_NULOU!	#DĚLENÍ_NULOU!	#DĚLENÍ_NULOU!			
Checking the amount of resources		Resources correspond to total costs	Resources correspond to total costs	Resources correspond to total costs	Resources correspond to total costs	Resources correspond to total costs	Resources correspond to total costs	

		Beneš a Lát, a.s.						
		2023	2024	2025	2026	2027	2028	TOTAL
Personnel costs	CZK							
Subcontracting costs	CZK							
Other direct costs	CZK	0	0	0				
Intellectual property costs	CZK							
Rest of direct costs	CZK							
Indirect costs	CZK							
Proportion of indirect costs	%	#DĚLENÍ_NULOU!	#DĚLENÍ_NULOU!	#DĚLENÍ_NULOU!				

Total costs	CZK	0	0	0			
Support	CZK						
Other resources	CZK						
Level of support	%	#DĚLENÍ_NULOU!	#DĚLENÍ_NULOU!	#DĚLENÍ_NULOU!			
Checking the amount of resources		Resources correspond to total costs	Resources correspond to total costs	Resources correspond to total costs	Resources correspond to total costs	Resources correspond to total costs	Resources correspond to total costs

		Univerzita Palackého v Olomouci						
		2023	2024	2025	2026	2027	2028	TOTAL
Personnel costs	CZK							
Subcontracting costs	CZK							
Other direct costs	CZK	0	0	0				
Intellectual property costs	CZK							
Rest of direct costs	CZK							
Indirect costs	CZK							
Proportion of indirect costs	%	#DĚLENÍ_NULOU!	#DĚLENÍ_NULOU!	#DĚLENÍ_NULOU!				
Total costs	CZK	0	0	0				
Support	CZK							
Other resources	CZK							
Level of support	%	#DĚLENÍ_NULOU!	#DĚLENÍ_NULOU!	#DĚLENÍ_NULOU!				
Checking the amount of resources		Resources correspond to total costs	Resources correspond to total costs	Resources correspond to total costs	Resources correspond to total costs	Resources correspond to total costs	Resources correspond to total costs	

		Participant name						
		2023	2024	2025	2026	2027	2028	TOTAL
Personnel costs	CZK							0
Subcontracting costs	CZK							0
Other direct costs	CZK	0	0	0	0	0	0	0
Intellectual property costs	CZK							0
Rest of direct costs	CZK							0
Indirect costs	CZK							0
Proportion of indirect costs	%	#DĚLENÍ_NULOU!	#DĚLENÍ_NULOU!	#DĚLENÍ_NULOU!	#DĚLENÍ_NULOU!	#DĚLENÍ_NULOU!	#DĚLENÍ_NULOU!	#DĚLENÍ_NULOU!
Total costs	CZK	0	0	0	0	0	0	0
Support	CZK							0
Other resources	CZK							0
Level of support	%	#DĚLENÍ_NULOU!	#DĚLENÍ_NULOU!	#DĚLENÍ_NULOU!	#DĚLENÍ_NULOU!	#DĚLENÍ_NULOU!	#DĚLENÍ_NULOU!	#DĚLENÍ_NULOU!
Checking the amount of resources		Resources correspond to total costs	Resources correspond to total costs	Resources correspond to total costs	Resources correspond to total costs	Resources correspond to total costs	Resources correspond to total costs	

		Participant name						
		2023	2024	2025	2026	2027	2028	TOTAL
Personnel costs	CZK							0
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Other direct costs	CZK	0	0	0	0	0	0	0
Intellectual property costs	CZK							0
Rest of direct costs	CZK							0
Indirect costs	CZK							0
Proportion of indirect costs	%	#DĚLENÍ_NULOU!	#DĚLENÍ_NULOU!	#DĚLENÍ_NULOU!	#DĚLENÍ_NULOU!	#DĚLENÍ_NULOU!	#DĚLENÍ_NULOU!	#DĚLENÍ_NULOU!
Total costs	CZK	0	0	0	0	0	0	0
Support	CZK							0
Other resources	CZK							0
Level of support	%	#DĚLENÍ_NULOU!	#DĚLENÍ_NULOU!	#DĚLENÍ_NULOU!	#DĚLENÍ_NULOU!	#DĚLENÍ_NULOU!	#DĚLENÍ_NULOU!	#DĚLENÍ_NULOU!
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Other direct costs	CZK	0	0	0	0	0	0	0
Intellectual property costs	CZK							0
Rest of direct costs	CZK							0