Project Title:

QUalifying and Implementing a user-centric designed and EfficienT electric vehicle

Project Acronym: QUIET

GA: 769826

Topic: **Electric vehicle user-centric design for optimized energy efficiency**

Topic identifier: **GV-05-2017**

Type of action: **RIA Research and Innovation action**

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Publishable Executive Summary

The objectives of QUIET are to reduce the energy needed for cooling and heating the cabin of an electric vehicle under different driving conditions, by at least 30 % compared to the Honda baseline 2017 and a weight reduction of about 20 % of vehicle components (e.g. doors, windshields, seats, heating and air conditioning) is also addressed. These efforts will finally lead to a minimum of 25 % driving range increase under both hot (+40 °C) and cold (-10 °C) weather conditions.

This is achieved by exploiting the synergies of a technology portfolio in the areas of:

- user centric design with enhanced passenger comfort and safety
- lightweight materials with enhanced thermal insulation properties
- and optimized vehicle energy management

The developed technologies will be integrated and qualified in a Honda B-segment electric vehicle validator.

The integration of the entire vehicle thermal management system (VTMS) into the electric vehicle validator is part of work package WP5. The process of the vehicle integration is described in this report D5.2.

Major part of this new VTMS is an energy-saving heat pump operated with a novel refrigerant, advanced thermal storages based on phase change materials and power films for infrared radiative heating of the cabin.

Based on the detailed performance analysis and assessment of the state of the donator vehicle (Honda FIT EV) the re-design of the vehicle thermal management system was started.
The results of those initial vehicle tests marked the baseline for the improvement of the VTMS. In a first step a system layout for a heat pump was designed and, taking into account the performance of already known components, the system performance was analysed with 1D simulation tools.
Additionally, the first discussion about the available space in the vehicle and the general approach concerning the re-use of some of the original components helped for detailing the simulation model with more performance data.
Geometrical investigation and a packaging assessment of the new system in the vehicle together with the results of the system simulation, defined the refrigerant cycle and the coolant circuits incl. all heat exchangers, valves, hoses etc. According this CAD design all parts were specified and ordered for the build-up either of the AC system testbed and the vehicle.

Activities:

Packaging, Design and Integration of the complete VTMS prototype system into the vehicle:

- Determination of the location of major components
- Overall packaging and space minimization to ensure the functional integration of the next-generation circuits
- Analysis of impacts on the thermodynamics and acoustics of the refrigerant circuit for various packaging variants. Installation of the components of the next-generation refrigerant cycle in the prototype vehicle and integration of sensors for validation of thermodynamic data.
- Fault-tolerant and economical assembly for fitting the refrigerant cycle in the vehicle

Method:

- Operating with the AVL List GmbH workshop equipment and the knowledge from previous vehicle integration projects. Using the AVL List GmbH control system development process and data analysis tools.

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Outcome:

Prototype vehicle in running order

- In the current reporting period, the new heat pump system was integrated into the Honda FIT EV.
- The integration was already started in parallel with the concept development and the layout of the new system.
- The existing VTMS system was analysed and the used components were rated if they could be used in the future system or have to be exchanged. Suppliers were contacted for of the shelf available components, their performance data and dimensions.
- Based on this information, both, performance and package compatibility were judged. The whole system had to fulfil the necessary performance and had to fit into an existing vehicle and its geometrical constraints.
- This process needed an ongoing close cooperation between the 1D simulation team, responsible for the system layout and performance and the CAD design team who did the packaging work. In several loops the system was optimised, and the necessary components have been defined.
- Also, safety aspects for the system had to be supported by the package and by the integration into the vehicle.
- In close cooperation with the project partners Obrist, Ventrex and Rubitherm the geometry of their new developed components was optimized to fit into the existing vehicle.
- Honda supported us with new components from other vehicles which fitted geometrically into our package. Two additional radiators in the vehicle front and a heater core working as low temperature radiator in the HVAC unit instead of the former evaporator are sourced from the spare parts catalogue of other Honda vehicle models.
- The packaging of all components, the layout of piping, hoses, all the necessary brackets and supports were designed by QPD and sourced for the vehicle build.
- The installation of all these components, the equipment with all necessary sensors for evaluation and control of the system as well as the initial operation in the vehicle are the content of WP5.

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Abbreviations and Nomenclature

Table 1: List of Abbreviations and Nomenclature.

Symbol or Short name	Description
AC	Air Conditioning
EV	Electric Vehicle
WP	Work Package
HVAC	Heating, Ventilation and Air Conditioning
HV	High Voltage
HV PTC heater	High Voltage Positive Temperature Coefficient Thermistor heater
CU	Control unit
ECU	Electronic Control Unit
PCU	Powertrain Control Unit
PCM	Phase Change Material
EXV	Electric Expansion Valve
PRV	Pressure Relief Valve
IHX	Internal Heat Exchanger
VTMS	Vehicle Thermal Management System
CRFM	Condenser Radiator Fan Module

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1. Introduction

The objectives of QUIET are to reduce the energy needed for cooling and heating the cabin of an electric vehicle under different driving conditions, by at least 30 % compared to the Honda baseline 2017 and a weight reduction of about 20 % of vehicle components (e.g. doors, windshields, seats, heating and air conditioning) is also addressed. These efforts will finally lead to a minimum of 25 % driving range increase under both hot (+40 °C) and cold (-10 °C) weather conditions.

The developed technologies will be integrated and qualified in a Honda B-segment electric vehicle validator.

Among these, a novel refrigerant for cooling, combined with an energy-saving heat pump operation for heating, advanced thermal storages based on phase change materials and power films for infrared radiative heating of the cabin were developed and will be investigated.

All the here mentioned components and the entire thermal management system, which are used in this smart concept are part of work package WP4, the integration into the vehicle is described in the present report D5.2.

Based on the detailed analysis and assessment of the serial status of the Honda FIT EV the performance targets for the re-design of the vehicle thermal management system (VTMS) were defined.
Data analysis and assessment of the vehicle tests set the baseline for energy demand to heat up or cool down the passenger compartment.
Some of the vehicles original VTMS components were analysed on the bench to determine their performance data. Due to the package situation in the vehicle it was clear, that the HVAC unit with its heater core and its blower have to be kept. Also the HV PTC water heater was defined to be kept in the future system. From the condenser, radiator, fan module (CRFM) in the front of the vehicle the radiator and the fan package were also defined to be kept for the future system.
All the valves, water pumps and heat exchangers for the refrigerant cycle were defined to be new for the heat pump system with its alternative refrigerant.
To avoid problems caused by flammability of the alternative refrigerant R290 a safety concept was discussed and was applied to the new VTMS.
One of the safety provisions which were chosen was a minimization of the necessary refrigerant amount.
Therefore, the refrigerant cycle was designed as compact as possible. The area in front of the AC compressor in the front right corner of the engine bay was defined as package space.
In the system bench tests the maximum filling amount of R290 was determined to be 270 grams.
Perhaps this amount may be further reduced in the vehicle. This has to be evaluated in a filling optimization at the beginning of the vehicle tests.

Another safety aspect was to avoid that even in accidental case R290 can stream into the passenger compartment. That was one major aspect to use an externally switched heat pump system. Not the refrigerant side is switched to use the refrigerant cycle for heating, just the path of the cooling water from the condenser is switched to use it for the heating in this case.
The water-cooled condenser has also the advantage that it is not any longer installed in the absolute front of the vehicle, where damages in case of accident or by stone chipping may be caused.
A pressure relief valve (PRV) in the refrigerant cycle, which was especially developed by Ventrex, guarantees that even under mis functional high pressure in the system the R290 blows of to the wheel house.
With all these safety provisions, we are confident that the use of R290 in the vehicle bears no higher risk than current refrigerants in automotive AC units.

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For storage of heat / energy by means of phase change materials (PCM), and later usage of this heat for e.g. faster heat up of the powertrain cooling circuit a thermal storage tank is planned for the vehicle set-up. The maximum available space underneath the vehicle was defined and provided the base for the development of the storage device for Rubitherm.

1.1. Description of the deliverable - Goals

This deliverable deals with the integration of the new thermal management system into the vehicle.

CAD design and packaging of the new components, sourcing of them and finally the integration of the system into the vehicle describes the major tasks. But from the beginning the limitation of the available space in the existing vehicle was also influencing the concept and the layout of the new system.

It was an ongoing iteration process between design, system simulation, project partners, suppliers and the workshop to get a running prototype of the vehicle thermal management system in the existing vehicle.

Even leading to a first prototype of the system our demand was to respect as much aspects as possible from serial production and overall vehicle safety demands.

2. Analysis of the original VTMS

2.1. The original vehicle cooling system

The original vehicle cooling system consists of 2 separate water circuits, one for cooling the powertrain and another one for cabin heating. For the battery pack, air cooling is applied.

As both water coolant systems are not interconnected, waste heat from the vehicle systems cannot be used for the cabin heating. This setup might have been chosen as the Honda Fit EV is a limited volume EV, which was only intended for certain markets, like California.

Furthermore, this model is based on the conventionally powered and space-efficient Honda FIT, from which it carried over the layout of the cabin HVAC unit.

The 2 water circuits are shown in red (heater) and yellow colour (cooling) in the system overview (Figure 1).

The heating water circuit (red colour) is also shown in the 3D data (Figure 2).

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2.2. The original refrigerant cycle

The refrigerant cycle is shown in blue colour in Figure 1 and Figure 2.

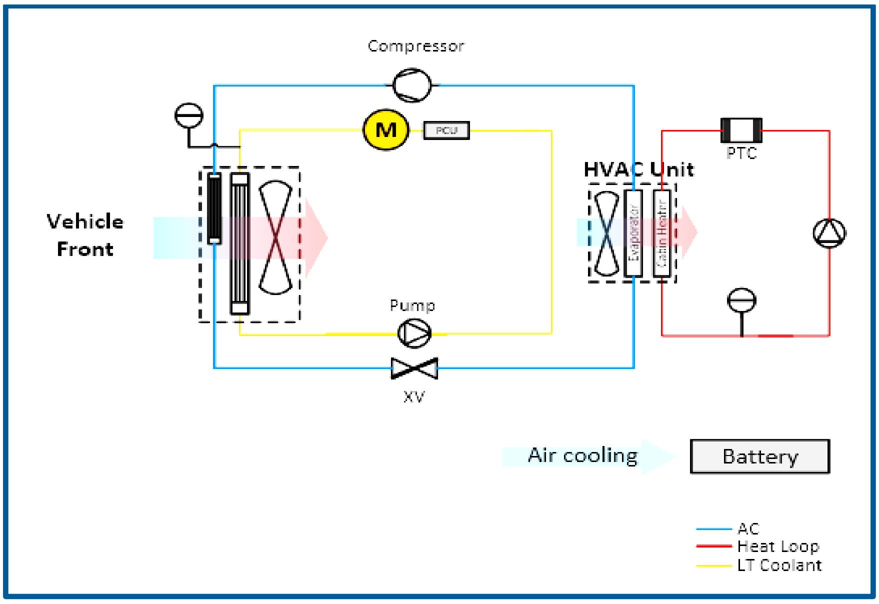

Figure 1: Schematic view of the original refrigerant cycle and the 2 water circuits

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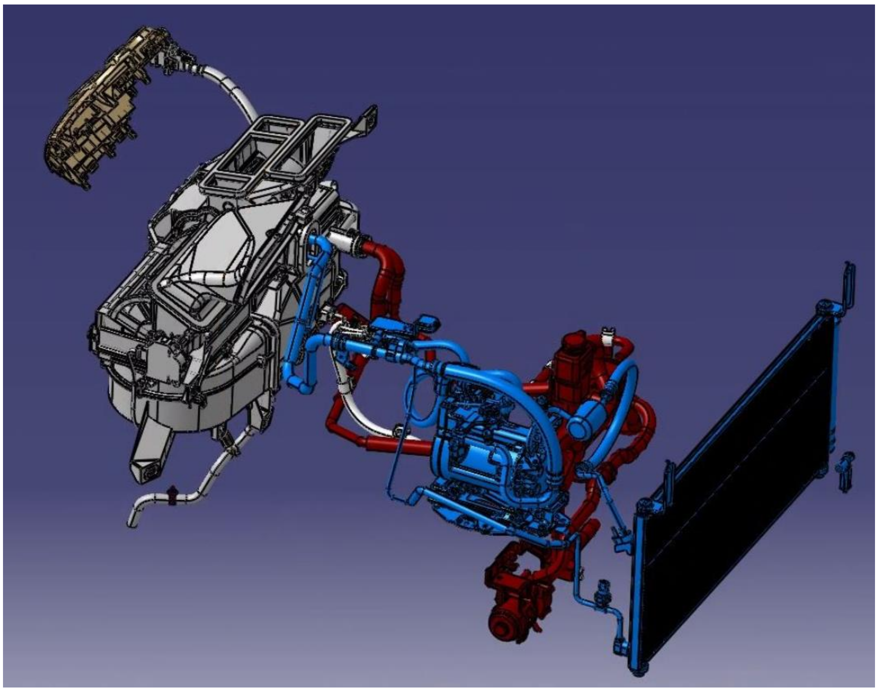

Figure 2: CAD Data of the original refrigerant cycle (blue) and heating circuit (red)

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3. The new QUIET heat pump VTMS

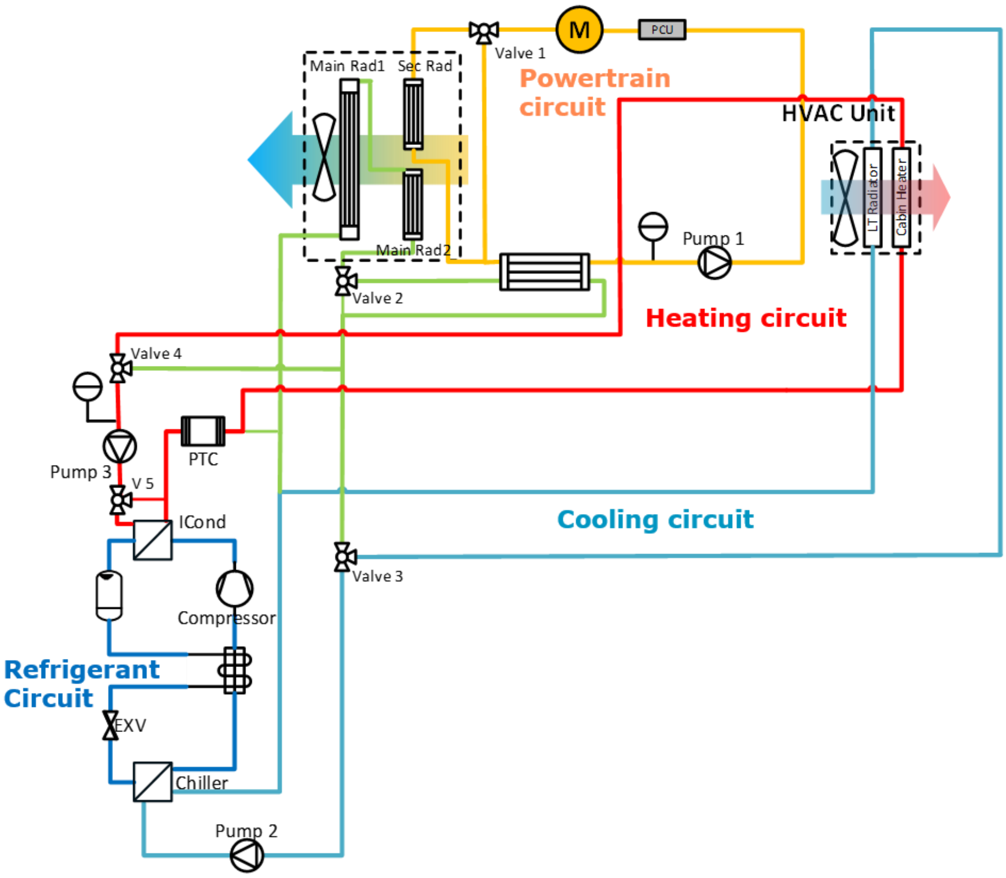

Figure 3: System layout of the new QUIET VTMS

The new layout of the VTMS is shown in Figure 3. The refrigerant cycle is again shown in blue color. Compared to the original cycle it has now an internal heat exchanger and the condenser and the evaporator are water cooled plate heat exchangers (Figure 4).

The 3 separate cooling circuits are shown. One circuit is to cool down the cabin, one is to heat the cabin and the third one is the cooling circuit for the powertrain.

In this layout the heat storage is not shown. We will show it later, integrated into the powertrain circuit.

Each cooling circuit is operated with an electric water pump. A total of 5 water valves allows to control the different operational modes and to switch the heat flow from the different sources to the needed heat exchanger.

In the HVAC unit a heater core (water/air heat exchanger) is installed for cooling of the cabin.

This schematic overview (Figure 3) was the base for the final CAD integration of the systems components, their brackets and supports and the design of the whole hydraulic routing.

The condenser and the evaporator are plate heat exchangers.

A third plate heat exchanger is used for the optional use of waste heat from the powertrain for the heat pump system.

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Totals	Unit	Value
Total weight (no connections)*	kg	2.87 - 4.02
Hold-up volume, inner circuit	dm³	0.549
Hold-up volume, outer circuit	dm³	0.610

Figure 4: Plate heat exchanger

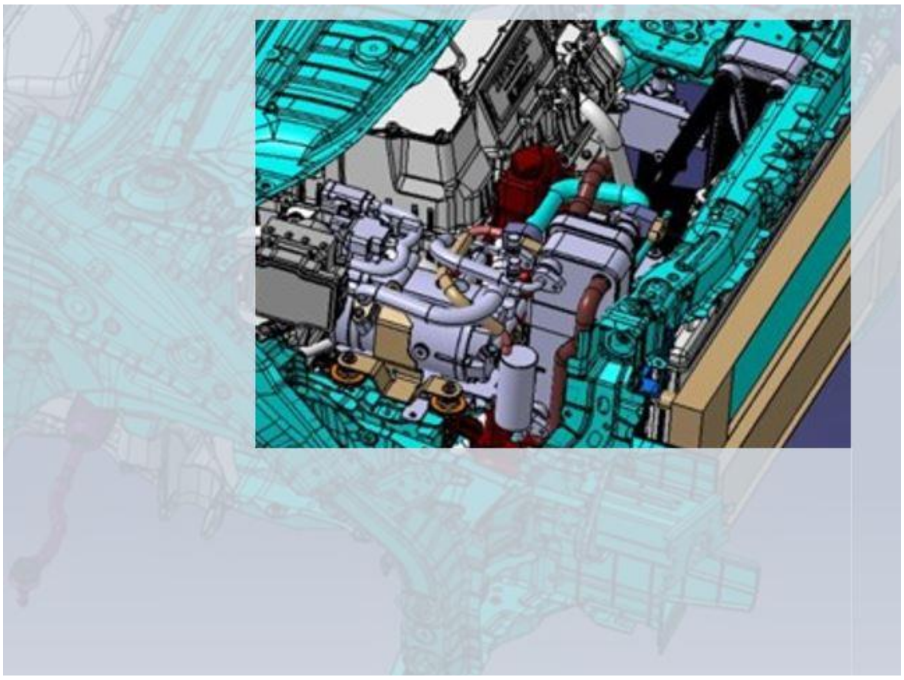

Figure 5: Geometrical integration of the QUIET VTMS into the vehicle

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4. The new refrigerant cycle

4.1. The new R290 AC compressor from Obrist

The position of the fixation points on the compressor housing, the orientation of the suction- and the high-pressure ports and the routing of the HV power supply cable was fixed in close cooperation between QPD and Obrist. We adopted a mounting system that we already optimized in a former project. This guarantees a good decoupling and NVH behavior. For the HV power supply Obrist re-used the original cable and plug, to avoid installation problems in the vehicle.

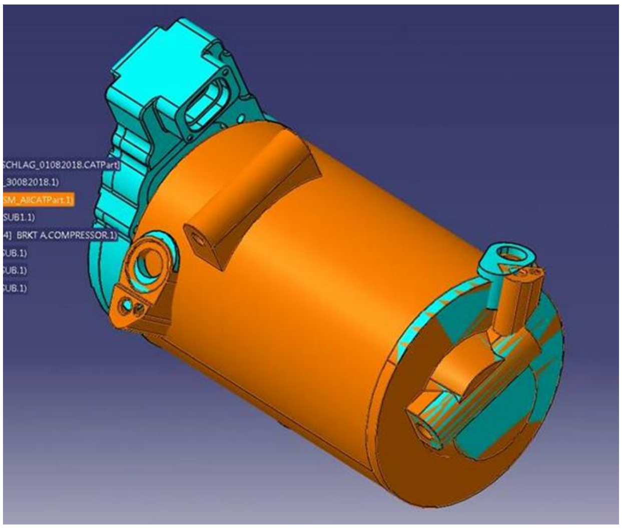

Figure 6: Package iteration loops for the compressor housing

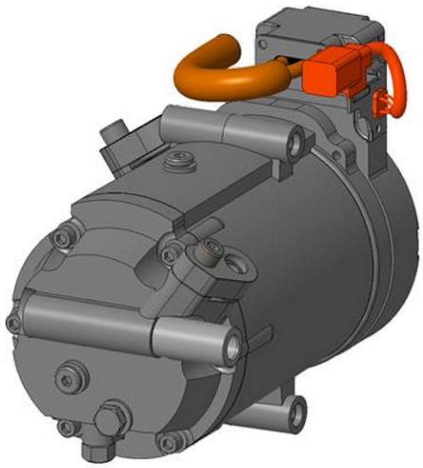

Figure 7: QUIET R290 compressor, final design

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4.2. Electronic expansion valve and pressure relief valve by Ventrex

For the geometrical integration of the valves into the refrigerant cycle the design of those valves was optimized during the design process.

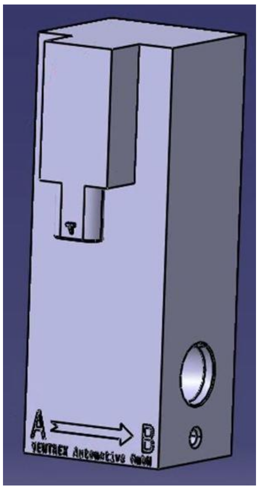

Figure 8: EXV design

Figure 9: Pressure Relief Valve

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4.3. Condenser and evaporator

In the new refrigerant cycle water-cooled heat exchangers are used instead of the air-cooled components in the base system.
The new refrigerant/water-heat exchangers we used are brazed stainless steel plate heat exchangers (Figure 4) which are available of the shelf from the Swedish company SWEP. The variety is quite big, and we could optimize size and performance to our needs.

4.4. AC pipes and hoses

The piping and hoses for the refrigerant cycle were manufactured according to our design as prototype parts. An internal heat exchanger, filling valves and an accumulator are directly integrated in the piping.

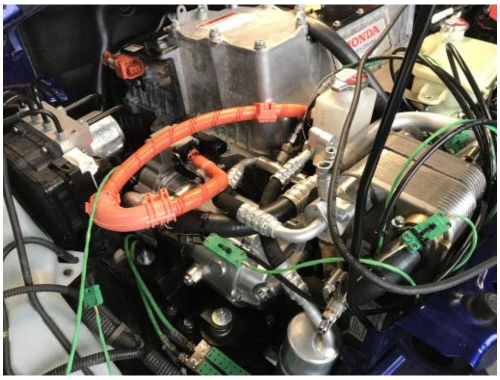

Figure 10: New AC cycle in the vehicle

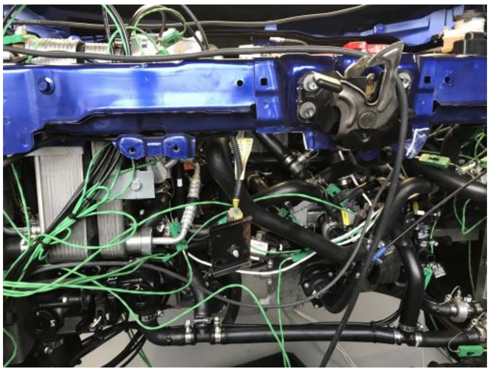

Figure 11: New condenser and evaporator

5. The coolant circuits

As already mentioned under point 3 and shown in figure 3, the new VTMS has 3 coolant circuits. One is for the powertrain, one for the heating and the third for the cooling of the cabin. With LIN operated water valves the coolant- and the thermal energy flow can be directed to the different heat exchangers to operate the heat pump system. The water valves are from the German manufacturer Henzel. All three coolant circuits are operated with the same electrical CWA 150 water pumps from Pierburg. This pump is a new developed part short before serial production.
All the rubber hoses of the cooling circuits were manufactured as prototype parts according to our design.

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The main radiator and the fan module were kept from the original vehicle. The old air-cooled condenser was removed. Using the space from the condenser, the radiator and the fans were shifted to the front to gain more space for the water valves, the water pumps and the hoses of the three coolant circuits.

5.1. The powertrain cooling circuit

The powertrain cooling circuit cools is hydraulically independent from the other two cooling circuits. Its purpose is to cool down the powertrain control unit (PCU) and the driving motor.

The heat from these components can either be dissipated to the ambient with an air/water cooler in the vehicle front, or it can be used for the heat pump by dissipation to the other 2 coolant circuits via the installed plate heat exchanger.

The heat storage tank with the PCM material is also integrated in this coolant circuit. 2 water valves determine the flow of the coolant to the front radiator, to the heat storage or to use the bypass directly back to the water pump.

The radiator of the powertrain cooling cycle is a small radiator from another Honda vehicle which is installed in front of the main radiator.

The area above and underneath the crash cross member was used for 2 additional radiators.

The second one is in series with the main radiator to increase the available surface for heat transfer in the cooling circuit.

Figure 12: The main cooling radiator and one of the additional radiators

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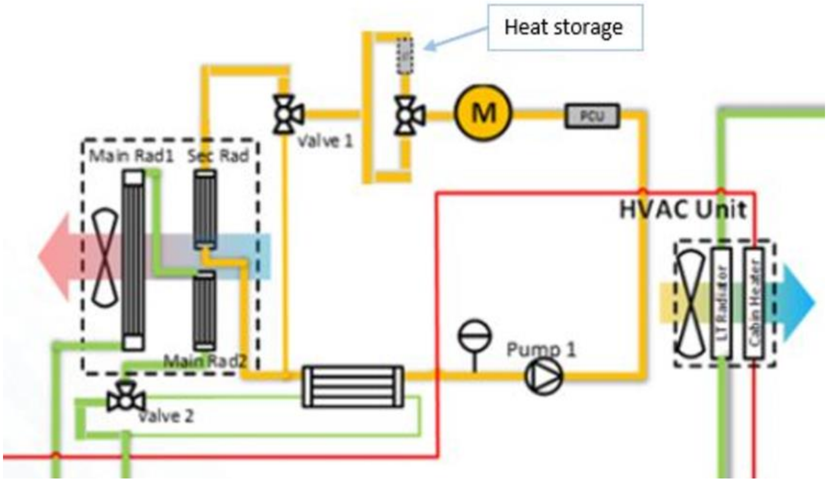

Figure 13: The powertrain cooling circuit with integrated heat storage tank

For the heat storage tank, the available space was defined in an early packaging phase and the possible dimensions were given to Rubitherm. A cuboid with approx. 10 liters volume can be installed underneath the driving motor. The housing of the heat storage prototype was produced according this first proposal and the prototype is now installed in the vehicle. Depending on the water temperature in the powertrain circuit the heat storage can be activated, charged or discharged. For example, during battery charging the waste heat from the on-board-charger can be used to charge the heat storage. Later after cold start of the vehicle the powertrain can heat up faster by discharging the heat storage. Heating up the drivetrain system and its lubrication can help to reduce friction losses in the drivetrain.

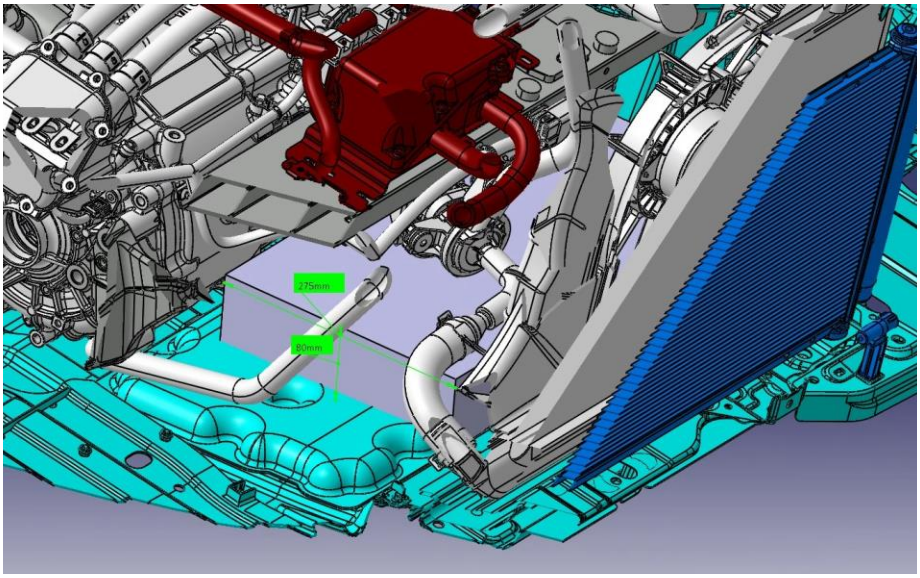

Figure 14: Heat storage tank, view from front, top right side

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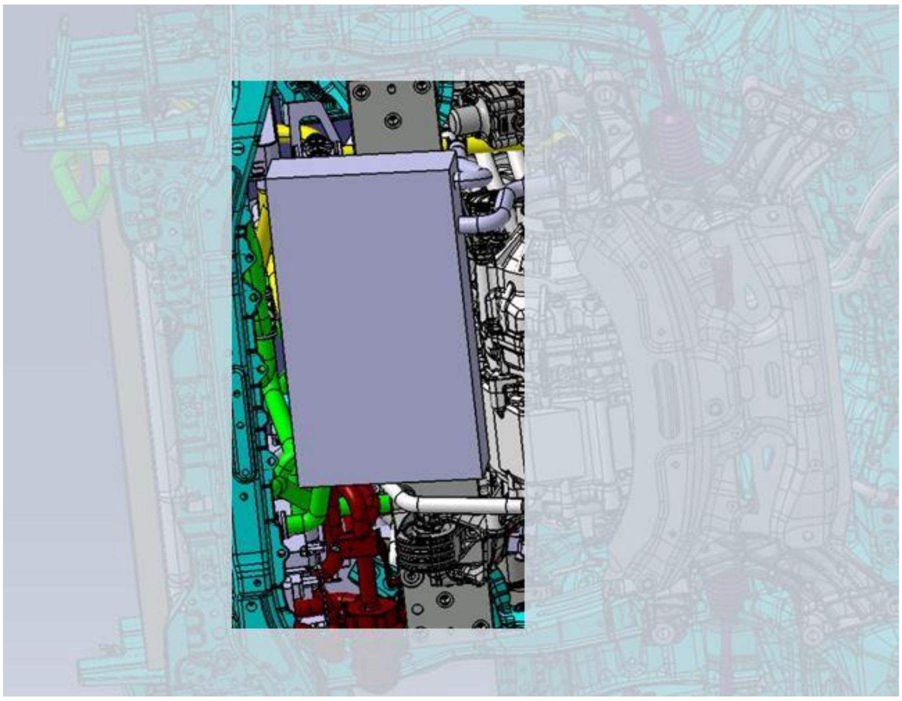

Figure 15: Heat storage tank, view from underneath the vehicle

Figure 16: Heat storage tank, prototype integrated in the vehicle

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5.2. The heating circuit

The heating circuit consists of the condenser, the High Voltage PTC heater and the heater core in the HVAC unit. It transports the heat from the condenser to the cabin. If there is not enough energy from the condenser or if the refrigerant cycle is off at extreme low temperatures, the HV PTC can also heat up the water in the heating circuit.

Under summer conditions the heat from the condenser is transported to the radiators in the front of the vehicle to be dissipated to the ambient. In this case this circuit uses parts of the cooling circuit. Those two circuits are connected, as for the heat pump function the front radiators are used in one case to dissipate energy from the condenser (summer) or to collect energy from the ambient and transport it to the evaporator (winter).

5.3. The cooling circuit

The cooling circuit transports the cold water from the evaporator to the low temperature radiator in the HVAC unit. This radiator, a spare part from another Honda vehicle, has been integrated into the original HVAC unit instead of the evaporator. The part was slightly smaller than the original evaporator, so we could directly use the old evaporator as a frame for the new low temperature heater core, what made the fixation easier, while all other functions from the original evaporator remained. For example, the drainage of condensate, the function of air distribution flaps.

Figure 17: Replacing the evaporator in the HVAC unit

Figure 18: Using the old evaporator as a frame

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6. Sensor equipment

The sensors shown in Figure 19 were installed into the VTMS.

There are thermocouples, pressure sensors, turbines measuring the volumetric flow, power and current of electrical components. Some of the signals are directly used to control the system, others are for evaluation of the system.

	name		description	measurement unit
			refrigerant cycle	
P1	P_KM_n_Chiller	pressure	refrigerant after evaporator	bar
T1	T_KM_n_Chiller	temperature	refrigerant after evaporator	°C
P2	P_KM_v_EXV	pressure	refrigerant before expansionvalve	bar
T2	T_KM_v_EXV	temperature	refrigerant before expansionvalve	°C
P3	P_KM_v_KMV	pressure	refrigerant before compressor	bar
T3	T_KM_v_KMV	temperature	refrigerant before compressor	°C
P4	P_KM_n_KMV	pressure	refrigerant after compressor	bar
T4	T_KM_n_KMV	temperature	refrigerant after compressor	°C
P5	P_KM_n_Icond	pressure	refrigerant after condenser	bar
T5	T_KM_n_Icond	temperature	refrigerant after condenser	°C
			coolant	
T6	T_KW_v_Icond	temperature	coolant before condenser	°C
T7	T_KW_n_Icond	temperature	coolant after condenser	°C
T8	T_KW_v_PTC	temperature	coolant before HV PTC heater	°C
T9	T_KW_n_PTC	temperature	coolant after HV PTC heater	°C
V3	V_KW_v_PTC	volumetric flow	coolant before HV PTC heater	l/min
T10	T_KW_v_CabinHeater	temperature	coolant before cabin heater	°C
T11	T_KW_n_CabinHeater	temperature	coolant after cabin heater	°C
T12	T_L_n_CabinHeater_li	temperature	air 1 after cabin heater	°C
T13	T_L_n_CabinHeate_mi	temperature	air 2 after cabin heater	°C
T14	T_L_n_CabinHeater_re	temperature	air 3 after cabin heater	°C
			coolant	
T15	T_KW_v_PCU	temperature	coolant before PCU	°C
T16	T_KW_n_M	temperature	coolant after motor	°C
T17	T_KW_n_ThermalStorage	temperature	coolant before heat storage tank	°C
T18	T_KW_v_ThermalStorage	temperature	coolant after heat storage tank	°C
T19	T_KW_Vlv1_3	temperature	coolant valve 1 bypass main radiator	°C
T20	T_KW_v_SecRad	temperature	coolant before powertrain radiator	°C
T21	T_KW_n_SecRad	temperature	coolant after powertrain radiator	°C
T22	T_L_n_SecRad_li	temperature	air 1 after powertrain radiator	°C
T23	T_L_n_SecRad_mi	temperature	air 2 after powertrain radiator	°C
T24	T_L_n_SecRad_re	temperature	air 3 after powertrain radiator	°C
F3	T_KW_F3_WT	temperature	coolant before plate heat exchanger powertrain coolant	°C
F1	T_KW_F1_WT	temperature	coolant after plate heat exchanger powertrain coolant	°C
V1	V_KW_n_Pmp1	temperature	coolant after water pump 1	l/min
			coolant	
F2	T_KW_F2_WT	temperature	coolant before plate heat exchanger cooling circuit	°C
F4	T_KW_F4_WT	temperature	coolant after plate heat exchanger cooling circuit	°C
T25	T_KW_n_Chiller	temperature	coolant after evaporator	°C
V2	V_KW_n_Pmp2	volumetric flow	coolant after water pump 2	l/min
T26	T_KW_v_Pmp2	temperature	coolant before water pump 2	°C
V4	V_KW_n_LtRadiator	volumetric flow	coolant after LT radiator	l/min
T27	T_KW_n_LtRadiator	temperature	coolant after LT radiator	°C
T28	T_KW_v_LtRadiator	temperature	coolant before LT radiator	°C
T29	T_L_n_LtRadiator_li	temperature	air 1 after LT radiator	°C
T30	T_L_n_LtRadiator_mi	temperature	air 2 after LR radiator	°C
T31	T_L_n_LtRadiator_re	temperature	air 3 after LT radiator	°C
T32	T_KW_Vlv4_1	temperature	coolant after valve 4	°C
T33	T_KW_Vlv2_3	temperature	coolant after valve 2	°C
T34	T_KW_n_mainRad2	temperature	coolant after main radiator 2	°C
T35	T_KW_v_mainRad2	temperature	coolant before main radiator 2	°C
T36	T_L_n_MainRad2_li	temperature	air 1 after main radiator 2	°C
T37	T_L_n_MainRad2_mi	temperature	air 2 after main radiator 2	°C
T38	T_L_n_MainRad2_re	temperature	air 3 after main radiator 2	°C
T39	T_KW_v_mainRAD1	temperature	coolant before main radiator 1	°C
T40	T_L_n_MainRad1_li	temperature	air 1 after main radiator 1	°C
T41	T_L_n_MainRad1_mi	temperature	air 2 after main radiator 1	°C
T42	T_L_n_MainRad1_re	temperature	air 3 after main radiator 1	°C
	n_Sauglüfter	rotation speed	main fan	U/min
	n_Gebläse	rotation speed	blower HVAC	U/min

Figure 19: List of sensors

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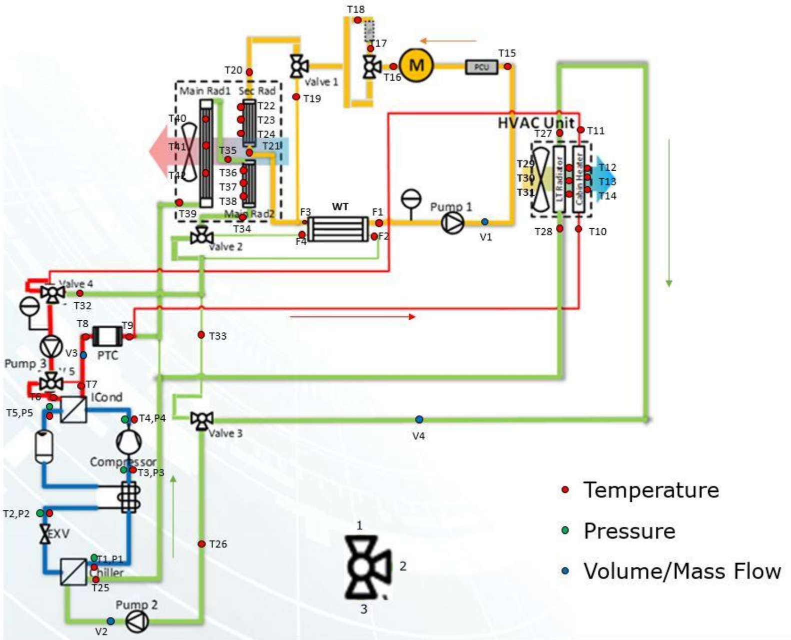

Figure 20: Position of sensors

7. IR heating power supply

The IR heating panels will be operated with 48V. Therefore, another voltage level had to be integrated into the vehicle. The 48V DC/DC converters are part of the control box from ATT.

With a HV power supply cable, produced according to our specification, this converter was integrated into the vehicles HV distribution.

The ATT control box itself was integrated in the vehicle's trunk.


Figure 20: HV power supply and ATT's control box for the IR heating films

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8. VTMS control

The ECU and the single board computer to control the new VTMS were developed by AIT.

Those components will be installed into the vehicle and will be connected to all actuators and sensors necessary to control the VTMS.

The complexity of the communication architecture is shown in Figure 21.

The ECU needs CAN information from the vehicle and from new sensors in the system. It controls either ‘old’ components of the vehicle as well as the new VTMS. Therefore, a quite complex communication architecture with CAN and LIN communication was developed and integrated.

This work was not finished up to now, so the initial operation of the system did not take place before finalizing this report.

It would have been great to report the successful operation already here, but it will need some more time before reporting this success.

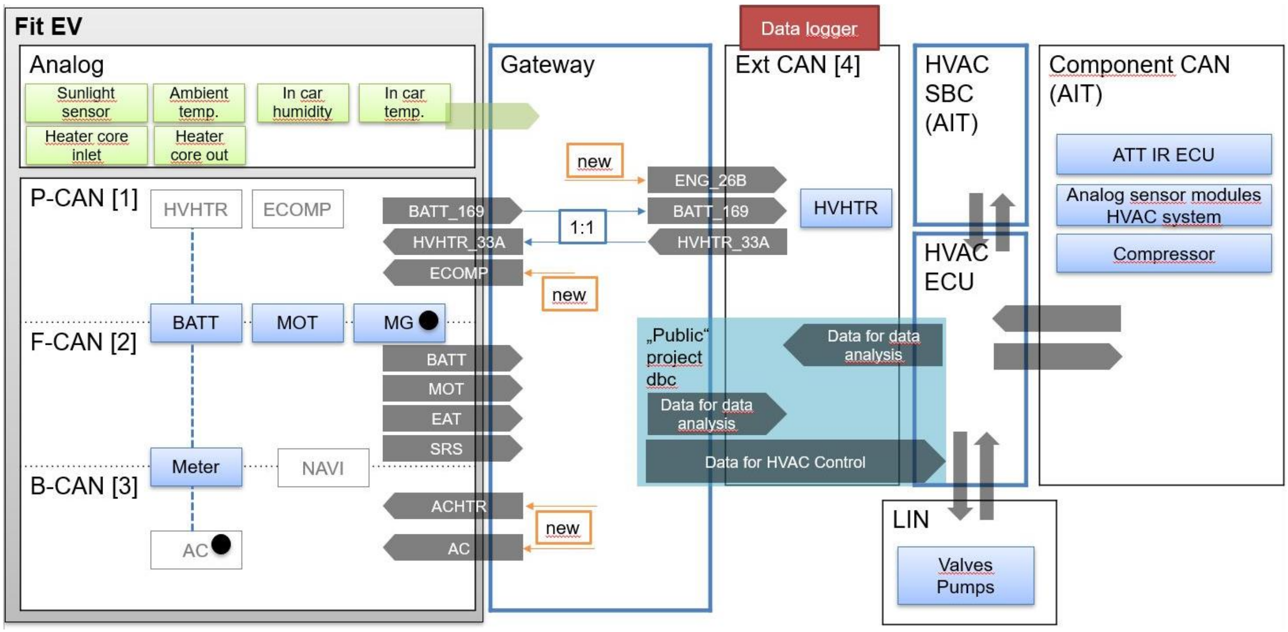

Figure 21: System architecture of the VTMS control

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9. Conclusions

Based on the QPDs package work and CAD design the new QUIET heat pump VTMS, developed by AVL could be integrated into the existing vehicle.

The new refrigerant cycle with R290 used as refrigerant, the special parts like the AC compressor developed from OBR, the expansion valve from VEN as well as their pressure relief valve as part of the safety concept are the base for the evaluation of the new system in the vehicle to confirm the increase of driving range while keeping the same level of comfort.

The three switchable coolant circuits allow the heat pump functionality to optimize energy flows and use ambient energy or waste heat to increase the efficiency of the system.

This is also supported by the heat storage tank from RUB including aluminium foam elements from IFAM.

Also, the IR radiation films from ATT support to keep the same comfort impression without heating the cabin air to a high level. Their 48 V DC/DC converters were also integrated into the vehicle and connected to the HV system.

The control unit and the HMI control board were developed from AIT and operated by the holistic simulation model that UOZ developed based on the HVAC control strategy from AVL the whole VTMS can hopefully show its potential in the following demonstrator vehicle tests. The ECU and the whole communication are the last step of the vehicle integration. This is still ongoing.

The integration of the system into the vehicle was delayed because of pre-agreed delay of other work packages. Their input was necessary as a base to start the integration of reworked components and to get the prototype parts from the project partners.

Outlook: As next important step the start of operation of the whole system in the vehicle, first time in combination with the control unit and all the necessary interfaces for system communication between the vehicle architecture, the new VTMS and all the sensors which are necessary to control the system will mark a milestone in the project.

When the systems run and the start of operation was successful, the validation of the potentials of the new VTMS in real vehicle application will start. This will be done with the demonstrator vehicle on the chassis dyno at HRE. The corresponding results will be presented in deliverable D5.4.

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Project Partners:

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3	**AVL**	AVL List GmbH	Austria
4	**QPD**	AVL Thermal & HVAC	Germany
5	**VEN**	VENTREX Automotive GmbH	Austria
6	**UOZ**	University of Zagreb	Croatia
7	**IFAM**	Fraunhofer Institute for Manufacturing Technologies and Advanced Materials IFAM	Germany
8	**ATT**	ATT advanced thermal technologies GmbH	Austria
9	**ECON**	eCon Engineering Kft.	Hungary
10	**RUB**	RUBITHERM Technologies GmbH	Germany
11	**STS**	SeatTec Sitztechnik GmbH	Germany
12	**OBR**	OBRIST Engineering GmbH	Austria
13	**JRC**	Joint Research Centre - European Commission	Italy