

Tesla and BYD lead the market again and go beyond cool

18-Jul-2023 10:00 GMT

Matthew Beecham

S&P Global

Supply Chain and Technology, Automotive

Cool ideas emerge as the EV market heats up

Regulating the temperature of an electric vehicle's (EV's) battery, electric motor and power electronics is a complex process. While most EV thermal management systems use a water tank, a chiller, and various electronics and actuators, the trend is toward an integrated thermal management system (ITMS) that can improve driving range and charging capability, as well as reduce module weight, size and cost. For example, by maintaining the battery pack within the ideal temperature range, the ITMS helps maximize the charging rate and overall performance. However, specific benefits of an ITMS would vary depending on the vehicle's design and system architecture.



The heat is on

Grouped around three categories — coolant-integrated module, refrigerant-integrated module and coolant-refrigerant module — ITMS are becoming increasingly popular. Coolant-refrigerant modules account for 46% of total ITMS modules used in EVs. By 2028, refrigerant-integrated modules will account for 38% of all ITMS modules, while coolant-integrated modules and coolant-refrigerant modules will account for 31% of total EV ITMS modules.

S&P Global Mobility forecasts that, by 2028, Tesla and BYD will lead the market in terms of ITMS development and deployment, followed by Stellantis, Geely, Volkswagen and BMW.

On a regional basis, Greater China is the biggest market and will continue to lead with demand for ITMS increasing from 2.6 million units in 2023 to 8.1 million units by 2028. The majority of mainland Chinese OEMs such as BYD, Geely, Nio and Xpeng EV have deployed ITMS in their current EV models. Although demand for ITMS units will continue to grow steadily in Europe from 2023 to 2028, significant demand from other regions is unlikely in the short term.

Tesla's head start

Tesla was first past the post, installing an ITMS for the Model Y in 2020. Its Model 3 already had a rudimentary coolant module called Superbottle used primarily to regulate battery cooling and heating. The Model Y's coolant-refrigerant module moved the game on by merging two manifolds (Supermanifold) and several electronic parts to provide a compact, lighter unit compared to a non-integrated system. Attached is Tesla's Octovalve, which controls the flow of fluid throughout the vehicle. It is named as such because it combines eight coolant inlets/outlets actuated by a single stepper motor.

Given that thermal management is another area where Tesla appears to have set the standard, others have been inspired to follow, including Geely and Hyundai (both installing a coolant-integrated module) and VW and BYD (both opting for refrigerant-integrated modules). However, none match the functionality of the Octovalve. Whereas Tesla's Octovalve uses a liquid cooling system to regulate temperature, BMW uses a combination of liquid cooling and air cooling to do the same job. Liquid cooling is typically more effective at transferring heat, while air cooling provides additional cooling in certain areas.

What else is cool?

The VW refrigerant module serves as a means of outsourcing the assembly process for AC lines, accumulator and chiller. On the other hand, the BYD refrigerant module features a highly integrated

design. Although it bears a resemblance to Tesla's design, its primary function is to control heat pump operating modes.

Chinese suppliers are catching up quickly. Huawei took less than two years to launch a similar Supermanifold in production for Avatr vehicles. Other suppliers pushing back the technical boundaries in the ITMS arena include Hyundai Wia, Marelli and the Schaeffler Group.

Implications

Is this another illustration of how, in the EV world, Tesla's and BYD's vertical integration is paying off? Simply put, no. Tesla is without a vertically integrated thermal components manufacturing capability. The Supermanifold is simply marked with Made in Mexico, and its suppliers have almost adopted an oath of omerta. BYD, Nio and Geely operate in a similar way.

It seems the old departmental structure of historical OEMs is no longer in vogue, at least if you want to get ahead in the BEV game.

Meanwhile, legacy OEMs will be able to play catch up when their next-generation BEV architectures are in place in the next few years. By then, do not be surprised if the likes of Tesla and BYD have moved the game on again.

S&P Global Mobility's [Component Forecast Analytics](#) provides timely, reliable, and comprehensive automotive component and technology data and powerful analytics from one of the most trusted sources in the industry. [Click here to learn more about our Thermal forecasts.](#)

CONTACTS

The Americas
+1 877 863 1306

Europe, Middle East & Africa
+44 20 7176 1234

Asia-Pacific
+852 2533 3565

www.spglobal.com/mobility

Copyright © 2025 S&P Global Inc. All rights reserved.

These materials, including any software, data, processing technology, index data, ratings, credit-related analysis, research, model, software or other application or output described herein, or any part thereof (collectively the “Property”) constitute the proprietary and confidential information of S&P Global Inc its affiliates (each and together “S&P Global”) and/or its third party provider licensors. S&P Global on behalf of itself and its third-party licensors reserves all rights in and to the Property. These materials have been prepared solely for information purposes based upon information generally available to the public and from sources believed to be reliable.

Any copying, reproduction, reverse-engineering, modification, distribution, transmission or disclosure of the Property, in any form or by any means, is strictly prohibited without the prior written consent of S&P Global. The Property shall not be used for any unauthorized or unlawful purposes. S&P Global’s opinions, statements, estimates, projections, quotes and credit-related and other analyses are statements of opinion as of the date they are expressed and not statements of fact or recommendations to purchase, hold, or sell any securities or to make any investment decisions, and do not address the suitability of any security, and there is no obligation on S&P Global to update the foregoing or any other element of the Property. S&P Global may provide index data. Direct investment in an index is not possible. Exposure to an asset class represented by an index is available through investable instruments based on that index. The Property and its composition and content are subject to change without notice.

THE PROPERTY IS PROVIDED ON AN “AS IS” BASIS. NEITHER S&P GLOBAL NOR ANY THIRD PARTY PROVIDERS (TOGETHER, “S&P GLOBAL PARTIES”) MAKE ANY WARRANTY, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, FREEDOM FROM BUGS, SOFTWARE ERRORS OR DEFECTS, THAT THE PROPERTY’S FUNCTIONING WILL BE UNINTERRUPTED OR THAT THE PROPERTY WILL OPERATE IN ANY SOFTWARE OR HARDWARE CONFIGURATION, NOR ANY WARRANTIES, EXPRESS OR IMPLIED, AS TO ITS ACCURACY, AVAILABILITY, COMPLETENESS OR TIMELINESS, OR TO THE RESULTS TO BE OBTAINED FROM THE USE OF THE PROPERTY. S&P GLOBAL PARTIES SHALL NOT IN ANY WAY BE LIABLE TO ANY RECIPIENT FOR ANY INACCURACIES, ERRORS OR OMISSIONS REGARDLESS OF THE CAUSE. Without limiting the foregoing, S&P Global Parties shall have no liability whatsoever to any recipient, whether in contract, in tort (including negligence), under warranty, under statute or otherwise, in respect of any loss or damage suffered by any recipient as a result of or in connection with the Property, or any course of action determined, by it or any third party, whether or not based on or relating to the Property. In no event shall S&P Global be liable to any party for any direct, indirect, incidental, exemplary, compensatory, punitive, special or consequential damages, costs, expenses, legal fees or losses (including without limitation lost income or lost profits and opportunity costs or losses caused by negligence) in connection with any use of the Property even if advised of the possibility of such damages. The Property should not be relied on and is not a substitute for the skill, judgment and experience of the user, its management, employees, advisors and/or clients when making investment and other business decisions.

The S&P Global logo is a registered trademark of S&P Global, and the trademarks of S&P Global used within this document or materials are protected by international laws. Any other names may be trademarks of their respective owners.

The inclusion of a link to an external website by S&P Global should not be understood to be an endorsement of that website or the website’s owners (or their products/services). S&P Global is not responsible for either the content or output of external websites. S&P Global keeps certain activities of its divisions separate from each other in order to preserve the independence and objectivity of their respective activities. As a result, certain divisions of S&P Global may have information that is not available to other S&P Global divisions. S&P Global has established policies and procedures to maintain the confidentiality of certain nonpublic information received in connection with each analytical process. S&P Global may receive compensation for its ratings and certain analyses, normally from issuers or underwriters of securities or from obligors. S&P Global reserves the right to disseminate its opinions and analyses. S&P Global Ratings’ public ratings and analyses are made available on its sites, www.spglobal.com/ratings (free of charge) and www.capitaliq.com (subscription), and may be distributed through other means, including via S&P Global publications and third party redistributors.