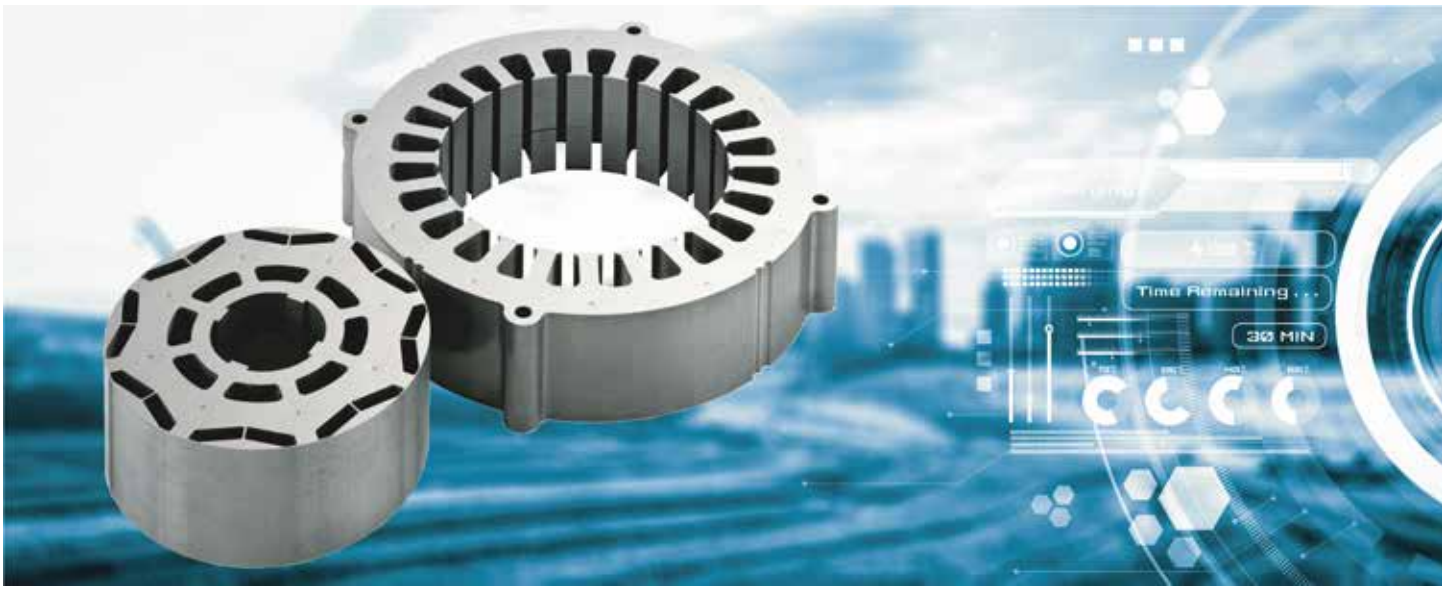



# GREEN TRANSITION IS DRIVING THE MOBILITY REVOLUTION

The automotive industry is entering a major transitional period that is said to occur only once a century.

The automotive sector environment is changing dramatically, and the demand for lighter yet more rigid vehicle bodies, improved motor efficiency, and higher battery output is more than ever. A technological revolution is giving rise to the new acronym "CASE" (Connected-Autonomous-Shared-Electric). As a result, the components that are used in vehicles are also undergoing major transitions.

Electrification will especially have a major influence in terms of vehicle parts. Assuming that a gasoline-powered vehicle is composed of a total of 30,000 discrete parts, transitioning to a battery electric vehicles (BEV) will result in approximately 11,000 fewer parts that are unique to gasoline-powered vehicles coupled with an increase of approximately 2,000 parts unique to a BEV, resulting in a net reduction of 9,000 parts. It is forecasted that two-thirds or more of the total number of vehicles sold worldwide by 2050 will be EVs.

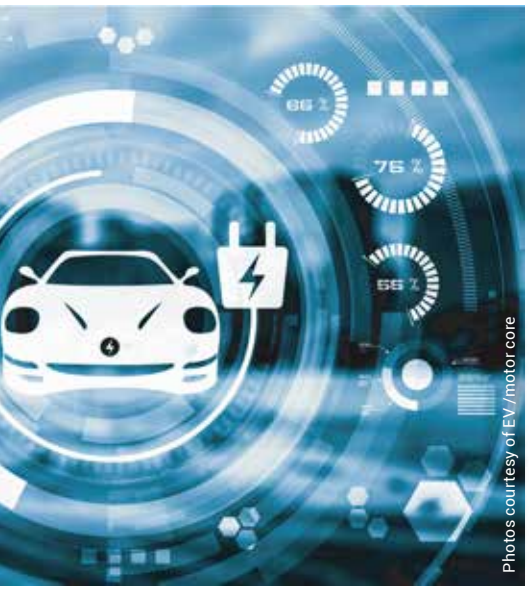
AIDA, The world's leading forming system builder is focusing on next-generation vehicle parts such as EV drive motor cores, lithium-ion battery cases, and fuel cell separators and had developed press equipment well-suited for each part accordingly.

## High-Precision Motor Cores Production

EV acceleration and cruising distance are greatly affected by factors such as electric motor output and battery capacity. Many of the parts that go into vehicles powered by electric motors must be made by standards equal to those used for high-precision devices. This requires manufacturers to update their facilities with equipment capable of high-precision, high-speed mass production.

Among the parts that go into a vehicle powered by an electric motor are composed of rotor, stator, and silicon steel plates that are between 0.15~0.5 mm thick. They are blanked in a continuous progressive forming operation at 200 strokes per minute or more, and staking & bonding methodologies are used to laminate these inside the die to create a motor core. To improve material yield, most rotors and stators are produced in the same die, and there are also cases where productivity is boosted even higher by producing multiple rotors and stators in the same die.

The magnetic flux density of a motor will drop as thinner and thinner silicon steel plates are used, but this also reduces iron loss. Thus it actually serves to improve the overall

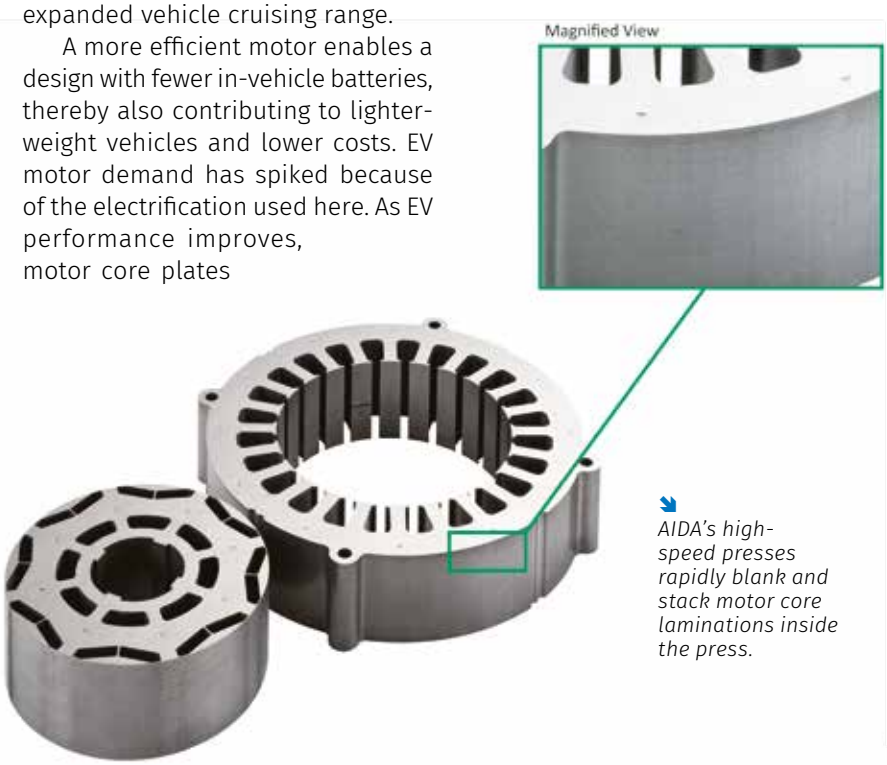



efficiency of a motor. High-output, high-efficiency motors are necessary to propel something as large as a vehicle. And as the performance of electric vehicles improves, the motor core laminations are becoming even thinner with even larger diameters. Because improving the efficiency of EV drive motors meritoriously reduce vehicle battery consumption, there comes the great advantage of an expanded vehicle cruising range.

A more efficient motor enables a design with fewer in-vehicle batteries, thereby also contributing to lighter-weight vehicles and lower costs. EV motor demand has spiked because of the electrification used here. As EV performance improves, motor core plates are becoming progressively thinner with larger diameters. The desired level of precision and maintainability required for dies is increasing, too.

The manufacturing of rotors and stators requires a unique know-how and AIDA's Multi-suspension Press ('MSP') Series high-speed precision presses equipped with the proprietary technology can stamp 300 sheets of EV drive motor cores per minute. With an outstanding accuracy and productivity, these high-performance, high-speed machines have garnered 90 percent of Japan's domestic market share. The MSP Series deliver forming capacities of 300 tons or higher, which require a higher overall level of technical skill to manufacture. Thus, making it ideal for electric vehicle motor cores manufacturing.

Large, super-precise dies are needed to produce motor cores for the high-performance motors used in electric vehicles. The MSP Series with wide bed areas for handling various types of laminations is among the leaders in this specialised field. It allows producing high precision and high-efficiency motors such as EV motors, HEV motors and even energy-efficient home appliances motors. MSP series presses are also highly regarded in Europe, the United States, and Asia.




*AIDA's high-speed presses rapidly blank and stack motor core laminations inside the press.*

## MSP Unique Features

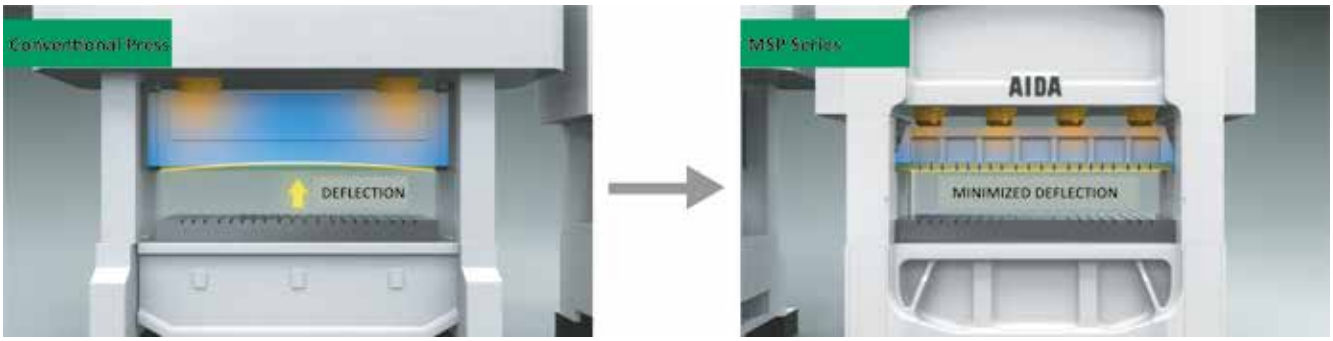
The MSP series has a multi-suspension design consisting of multiple points arranged in a row in the left/right direction of the press, and AIDA offers both 3 and 4 suspension point models based on the left/right dimension of the press slide and the capacity of the press. Multi-Suspension Design's major advantages over a conventional 2-point press:

### 1 Less Slide Deflection

The narrower spacing between the points reduces slide deflection and can improve product accuracy stability and die durability. It is especially essential in cases where the thin plate material is being laminated inside the die by means of a staking process, as press slide deflection greatly influences the precision of the staking process.

### 2 Stable Bottom Dead Center Accuracy

A conventional 2-point press is designed so that the slide thickness itself is what bears the load that is applied at the centre of the press. In the case of a press with a large left/right dimension, the slide must be designed to be much thicker and larger in order to suppress this deflection. Increasing the size of the slide also increases its inertial force, which increases variations in the bottom dead centre position during press starting and stopping, and thus can adversely affect product accuracy during staking, etc. This is because MSP series, presses bear the load being applied at the centre of the press over multiple suspension points, it was possible to make the slide smaller. A smaller




*Comparison of Point Designs.*

slide means a smaller inertial force, which contributes to stable product accuracy by suppressing variations in the bottom dead centre position during press starting and stopping.

### 3 Compact Overall Height

As previously mentioned, by making the slide smaller, etc., AIDA has been able to achieve an overall press height comparable to the height of a 2-point press. In the case of a 3000 kN press, it has achieved a height reduction of approximately 10 percent, enabling it to be easily installed even in a factory with a low ceiling.

### High Accuracy And Maintaining Accuracy

MSP series' accuracy and total clearance specifications easily surpass the highest accuracy class (Special Class) in Japanese Industrial Standards -JIS (JIS B 6402-2020) to assure high accuracy. Though the proper die clearance will vary depending on the blanking location, it is generally 5~10 percent of the material thickness. When stamping material that is 0.3 mm thick, the proper clearance would be between 0.015~0.03 mm, and thus in addition to a high-precision die, a high-precision press that can accommodate such a die also becomes necessary.

Since straightness and parallelism are primarily dependent on the machining precision of the press itself, the main structural components are machined in AIDA's temperature-controlled factory and then subjected to stringent accuracy inspections prior to assembly. Slide guides influence perpendicularity, and AIDA utilises high-rigidity zero-clearance needle roller guides that not only improve static accuracy, but they also enhance dynamic accuracy because they are positioned between the slide and bolster near the passline where actual press-forming occurs.

The electrification and digitisation of automobiles is an important part of achieving a "mobility society" which allows people to move about freely. As the shift from vehicles with internal combustion engines to EVs and other types of vehicles using electric motors continues, the composition of parts used in automobiles is also changing greatly. AIDA will continue to contribute technological innovations in the automotive-related industries with unique technologies and manufacturing capabilities.

*For more info, please log on to www.aida.com.sg.*


*MSP-3000-370 High-Speed Precision Press (wide bed type)*
*High-end series of larger high-speed presses equipped with more suspension points to drive the slide, achieving an even higher level of ultra-precision forming.*

EDITORIAL
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