

Lamination sheet, stack or assembly?

The requirements for advanced electric motors can be fulfilled solely by a holistic view.

Thomas Stäuble, SWD AG

Summary

This article talks about new principles in the production of electric motors. The focus is on the lamination stack instead of the lamination sheet. Today, often the requirements for the single sheet are specified in detail, but adapted to the guidelines of the punching shop. Finally, the properties of the lamination stack are of interest and this needs various considerations from design to production. So, new approaches are required in order to produce motors fulfilling the increasing requirements.

The construction and production of electric motors is facing its greatest development ever. Electro mobility is still a niche, but it is growing continuously. New concepts and constructions are being developed which evolve from simple motors towards recuperation functionality and even the replacement of a mechanical clutch by an electrical one. In the field of mechatronics, highly compact motors are required to replace the widely used combination of motor, gear and mechanics or to replace pneumatic solutions. New concepts will reduce size and maintenance. All applications have in common that motors have to be more efficient, deliver higher output power, torque, dynamics, reach a higher speed, a.s.o. Additionally, the automotive industry requires a highly efficient production setup to reduce raw material, production energy and to minimise quality costs. Finally, those requirements can be fulfilled by new motor concepts. This article talks about the development of the lamination stack production. The lamination stack, as an important active part in the motor, influences the electrical, magnetical and mechanical properties of the motors. Still, it is often considered rather unimportant which, is a mistake, because required improvements of the motor performance are given away easily.

Developments in production

The production of lamination stacks has already faced innovations and developments in the past. Before specialised stamping companies emerged, every motor builder produced the laminations itself by cutting, corroding or punching. As time evolved, punching companies have taken over this process step and the motor builders have received laminations. The stacking of the laminations in these days was done by riveting. Later on, welding and interlocking has evolved. The punching companies followed this trend and now provide these stacking technologies in their product portfolio.

Bonded lamination stacks

Nowadays, bonding of lamination stacks becomes more and more popular. The benefits of bonded lamination stacks are: high precision of the stack, high mechanical stiffness which facilitates easier handling and even machining of the stack (e.g. drilling a hole), insulation between the laminations and seldom short cuts, no cushioning, less liquids and oil absorption. Due to the new production processes, the lamination stacks fulfil the customer requirements better. In the end, not the properties of the single lamination, but the properties of the whole stack are of interest. In this meaning, the lamination is an ingredient and the stacking process is the recipe.



Picture 1: Bonded stator segment



Picture 2: small, precise stack in NO20

Holistic view on the stack

For the production of the lamination stacks, a very specialised know-how of the different stacking technologies is required. It starts from the lamination geometry which has to consider the punching process and the stacking technology, continues to the processing of the assembly and includes the logistics and supply chain. A holistic view is important to achieve the maximum possible and to carry motor technologies to the next level. At this point, a stacking specialist helps. Early taken into account, the specialist already gives important hints in the development process to simplify and facilitate the large series production. Subsequent tests and verifications bolster a robust and process capable serial production.

Afterwards, the specialist completes the value chain by providing lamination stacks which exactly fulfil the requirements. The stacks are produced in a production setup which ensures high quality and continuous supply with short lead times.

Better properties evolve better motors

The stack instead of the sheet is in the focus. The stacking technology can have the same influence on the motor performance as the selection of the lamination material. This too often unknown potential will bring the motor and production improvements ahead. The combination of the specialised know how in the field of the lamination, the stacking technologies and the process capable serial production will result in a competitive advantage of the motor, not only in a technical view, but also in a commercial view. An early and holistic view will reduce costs also due to better process setup, less scrap, less quality control, less storage a.s.o.

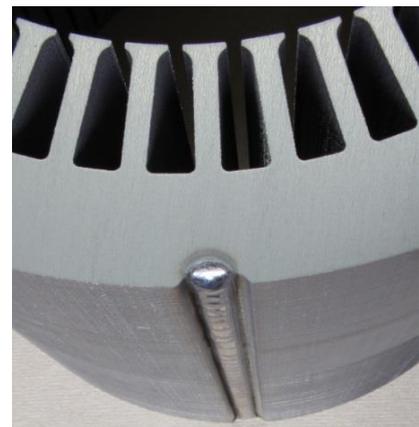
The company

SWD AG Stator- und Rotortechnik is an innovative medium-sized company in Switzerland. We are dedicated to the development and production of lamination stacks and support our customers with new technologies from prototypes up to series production.



Stator- und Rotortechnik

SWD AG – Stator- und Rotortechnik
Kaisermatt 3
5026 Densbüren
Tel.: +41 (0) 62 867 92 18
www.swd-technology.com
info@swd-technology.com



Picture 3: welded stack