

## **Abstract**

Linear machines can directly produce linear motion without any intermediate transmissions, which have the merits of high acceleration, high precision, high velocity, simple structure and so on. They have been successfully applied in maglev train, high precision machine tools, semi-conductor devices, lithography machines, and intelligent transportation systems. Novel topologies and applications are important research hotspot. In recent years, they have been attracted by more and more researchers and companies. This speech summarizes the current status and development trend of novel topologies and new applications of linear machines. First, different topologies and optimization designs of permanent magnet linear synchronous motors (PMLSMs) are introduced for high force performance. Second, many primary-excited permanent magnet linear motors (PE-PMLMs) are introduced for low cost, and technical challenges and research progress of various kinds of PE-PMLMs are highlighted from the perspective of structures. Third, the electromagnetic performance of all kinds of PE-PMLMs are comprehensively compared and analyzed. Finally, new applications and features of corresponding PMLSMs are described, such as intelligent transport systems, ropeless lifter, and grinders, etc.