From Servo-Hydraulic to All-Electric: MDRCBB & LSI's Game-Changer for Dental Testing

EdynART All-Electric Mastication Simulator Successfully Delivered to the University of Minnesota, Accelerating Clinical Translation of Dental Materials

The EdynART All-Electric Dual-Channel Mastication Simulator, jointly developed by LSI Systems and the Minnesota Dental Research Center for Biomaterials and Biomechanics (MDRCBB) at the University of Minnesota School of Dentistry, has been officially delivered and put into operation. This milestone event marks the global mastication simulation technology's leap from the servo-hydraulic era to the new era of all-electric intelligent control, providing a revolutionary testing tool for the clinical translation of dental materials and demonstrating the core competitiveness of China's high-end testing equipment in the world's top scientific research field.

Strong Alliance: From Laboratory Innovation to Industrialization

As an authoritative institution in oral biomechanics research, the University of Minnesota's MDRCBB is renowned in the dental community for pioneering servo-hydraulic controlled mastication motion simulation technology. The laboratory results generated by this technology are highly consistent with long-term clinical observation results, making it the only testing equipment that complies with U.S. FDA regulations. All new materials from Solventum (formerly 3M Healthcare) are entrusted to MDRCBB for verification and screening on the mastication simulator before clinical trials, thus ensuring an almost 100% clinical pass rate.

Based on decades of research accumulation, MDRCBB commissioned LSI Systems to jointly develop the second-generation mastication simulator. Inheriting the mature simulation principles of the first generation, EdynART adopts modern all-electric dual-axis drive technology to achieve more

precise and efficient motion control, significantly enhancing the test scenario setup, data collection, and analysis capabilities.

Technological Breakthrough: All-Electric Dual-Channel Precise Simulation of Oral Mechanical Environment

The EdynART Mastication Simulation System accurately reproduces the three-dimensional mechanical behavior of human mastication through dual-axis synchronous/asynchronous closed-loop control. The system has a maximum axial load of 500N and a maximum horizontal load of 300N, which can simulate various oral mechanical scenarios from gentle chewing to intense bruxism.

The equipment adopts high-sensitivity, high-precision, low-friction linear motor technology, combined with water and air dual cooling systems, to ensure reliable long-term continuous operation. Its six-degree-of-freedom maxillary and mandibular position adjustment function can simulate various occlusal states to meet different research needs.

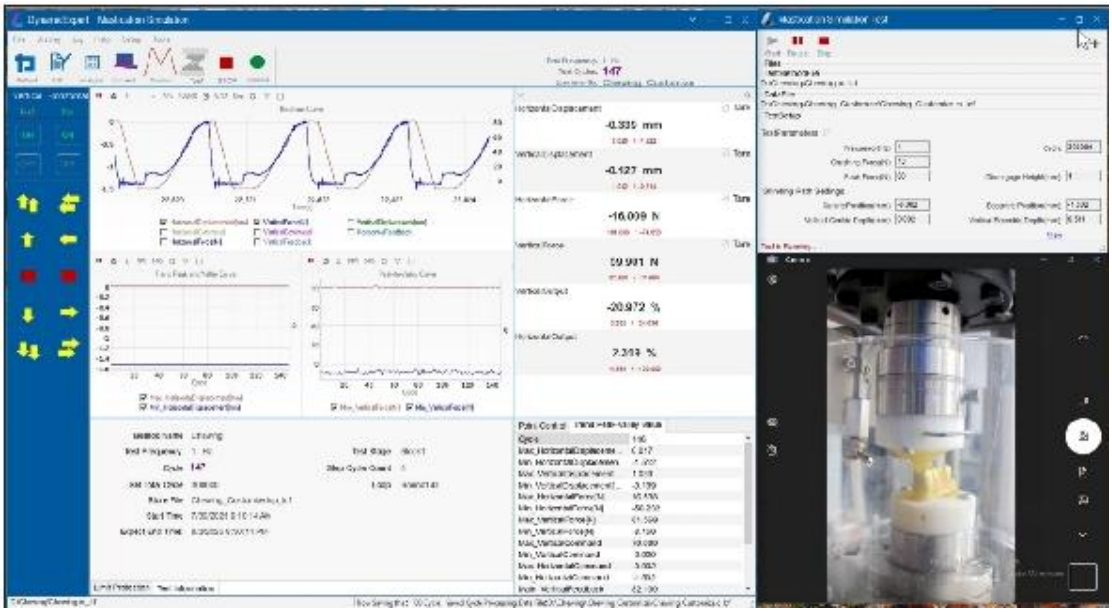
The core sensor adopts original fatigue-grade load sensors from Tovey (USA), with an overload resistance of more than 300% and a linear accuracy of 0.03%, ensuring the accuracy and reliability of data collection.

Realistic Oral Environment Simulation: Comprehensive Coverage from Mechanics to Biochemistry

The system integrates a biological fluid supply system for oral environment simulation, which can maintain the test fluid medium such as artificial saliva within a stable temperature range of 37°C ± 2°C. Unlike the traditional direct heating method using electric heating coils, this system uses a corrosion-resistant stainless steel heat exchanger for fluid heating, which can effectively reduce oxidation risks and avoid fluid contamination.

Intelligent Measurement and Control: Professional Software Platform Improves Research Efficiency

The dedicated mastication simulation test software developed based on the multi-functional dynamic testing software DynamicExpert features an intuitive program editing interface and test setup interface. The software supports load and displacement control as well as control switching of axial and horizontal actuators, and can flexibly set parameters such as oral opening space, occlusal peak and valley values, and grinding trajectories.



The software is equipped with real-time curve display and peak-valley trend monitoring functions, supporting linear storage, logarithmic storage, and their combined storage modes. Data can be exported as CSV files in real-time, providing complete data support for scientific research analysis.

Clinical Relevance: High Consistency Between Laboratory Data and Clinical Results

According to the preliminary research data of the University of Minnesota, the wear results generated by the mastication simulator are highly correlated with clinical observation results. Studies have shown that 250,000 cycles of simulation are equivalent to one year of clinical use, with a correlation coefficient as high as 0.84-0.94. This important finding enables material R&D enterprises to quickly screen and optimize material formulas in the laboratory before investing in expensive clinical trials.

The equipment can be widely used in wear resistance testing, fatigue performance evaluation, bond strength assessment, failure analysis, and other fields of dental materials, providing a reliable performance verification platform for dental restorative materials, implants, orthodontic appliances, and other products.

Future

The successful cooperation between the University of Minnesota's MDRCBB and LSI Systems provides strong tool support for oral biomaterial research. The official commissioning of the EdynART All-Electric Dual-Channel Mastication Simulator will significantly accelerate the R&D process of new dental materials, reduce clinical translation risks, and contribute Chinese wisdom and technological strength to the progress of global stomatology.

As a national high-tech enterprise, LSI Systems will continue to maintain close cooperation with top global research institutions, continuously promote the innovation of testing technology, provide more advanced and reliable testing solutions for biomaterial R&D, and help the high-quality development of the global medical and health industry.

For more technical details or application solutions of the EdynART All-Electric Mastication Simulator, please feel free to contact us:

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