

Ultra High-speed Micromachining Center



Problem Statement: Microscale feature creation using micro-milling/drilling is used in lithography masks, micro-moulds, micro-needle arrays for drug delivery, microfluidics, miniature heat-exchangers, etc. These features use microscale tools (25-500 μm diameters) with limited flexural stiffness, which can be overcome by using ultra-high spindle speeds (>100,000 rpm). However, due to the lack of technical know-how and prohibitively expensive solutions offered by German companies, there is very low penetration of this technology in India. The researchers at IIT Bombay hope to bridge this gap by providing ultra-high-speed technology solutions in the form of precision high-speed micromachining centres and fabrication services to the Indian industry and strategic sector.

Uniqueness of the Solution: The technology provides science-enabled solutions for various challenging applications pertaining to micro manufacturing. The developed system

is the first of its kind in the country. The machine has been engineered for minimal vibration, and chatter-induced tool failure has been addressed via predictive stability modelling. The developed Ultra High-speed Micromachining Centre can compete with state-of-art German and Singaporean systems and will boost the global competitiveness of the Indian industry in the micromanufacturing domain.

Current Status of Technology: The first system developed at IIT Bombay has been working for the last ten years, which shows its robustness and durability. In addition, two fully functional high-speed machining centres were recently supplied to IIT Bhilai and BITS Pilani, Hyderabad.

Societal Impact: Currently, the world is rapidly moving towards miniaturisation. The technology has the potential to create a vibrant micro manufacturing ecosystem in India and catalyse machine development and micro-manufacturing

services in the country; it can boost employment in the country.

Patent(s): Filed

Relevant Industries: Micromachining, Lithography Masks, Biomedical Implants, Jewellery, Micro Moulding, Defence.

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