Turchan
Technologies Group, Inc.

Background on T-Tech

Overview

T-Tech designs and builds advanced manufacturing systems, as well as individual machines that are integrated into customers' manufacturing lines. T-Tech also machines and fabricates components for the Big Three automotive companies and other Tier One suppliers. T-Tech scientists and engineers have also developed proprietary, laser-based technology for synthesizing new materials, treatments and coatings.

T-Tech's production facility encompasses high-speed machining operations, as well as a state-of-the-art developmental laboratory used for advanced, laser-based coatings such as synthesized thin-film diamond. Manuel Turchan is the visionary for the Company's technological advances, having designed and built several leading-edge-manufacturing systems since the 1970's. Some of manufacturing systems he has designed and developed includes:

- The first aerospace production application of ultra-high-speed machining, which was developed for General Dynamics to machine the fuselage of the Tomahawk Cruise Missile;

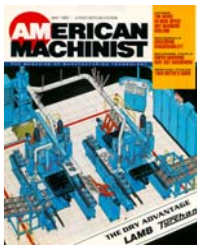
- Unique five-axis, high-speed machining systems for Rockwell International, which are used to produce thermal protection system tiles for the outer skin of NASA's Space Shuttle;

- The first production installation of a high-powered CO_2 Laser Drilling System for Boeing, which was used to produce the 757 and 767 airliners;

- A unique, multi-axis, high-speed special purpose magnesium and titanium machining system for Martin Marietta, which was used to produce components for the International Space Station;

- The "Thriller Tool", which drills, chamfers and thread-mills in one pass and was developed for GM/Saturn as part of a flexible manufacturing system for machining integral cylinder heads and blocks; this system reduced required plant floor space for those operations from 150,000 square feet to 4,000 square feet: the "Thriller Tool" has been licensed globally to several major cutting tool manufacturers.

- The first production installation of a high-volume, dry-machining system (which is a system that requires no coolant) for large, cast aluminum parts; 13 of these systems were sold to GM, Ford and DCX; the systems have saved the Big Three hundreds of millions of dollars and they are the epitome of environmentally-conscious manufacturing.



The above machining systems and applications attest to the spirit of innovation at T-Tech. Such engineering sophistication is the foundation of the Company's manufacturing operations, which are continually being enhanced by ongoing developmental breakthroughs.

Operational Capabilities

T-Tech operates from a 130,000 square foot facility in Dearborn, Michigan. The Company's precision machinery is used to produce automotive parts for General Motors and other Tier One automotive suppliers. T-Tech's equipment roster includes 40 computer-controlled machining systems – most of which have multi-axis capabilities – and automated laser welders. These machines rapidly produce critical, sole-sourced parts to tight tolerances.

T-Tech holds ISO 9002 and TS-16949 quality certifications. T-Tech enjoys very favorable quality ratings with all of its customers, in part because the Company has designed and implemented sophisticated quality systems that are governed by an experienced quality management team.

Advanced Materials and Surface Treatments

A $20 million laser facility and accompanying scientific laboratory is used for developing applications in the area of advanced surface coatings, as well as for limited production runs of treated components.

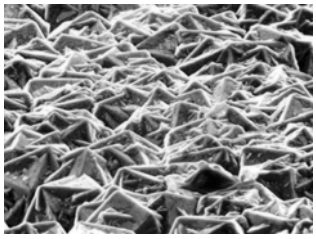
T-Tech develops proprietary laser-based processes to synthesize super-hard materials and other coatings onto the surface of wear parts, tooling and other workpieces. Diamond has long been considered an ideal material for many commercial and industrial products due to its hardness, lubricity, inertness, thermal conductivity, abrasion resistance and other superlative properties.

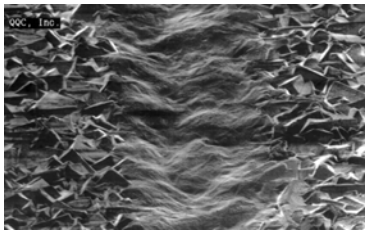
However, in the past, the cost of manufacturing products from natural and synthetic diamond has limited the market for diamond-coated products. The scientific and business communities have spent many years and substantial research dollars to perfect diamond-coating technology, yet failed to develop an economically feasible process.

T-Tech has proprietary technology that produces a thin-film diamond coating thousands of times faster than conventional processes. The Turchan Process® uses lasers and inert reactant gases to convert the surface of a work-piece to diamond without altering the dimensions of the treated part. The discovery of this process was the result of extensive theoretical and laboratory research; that discovery has been widely chronicled in numerous technical journals, and it has been validated by academic and governmental laboratories.

Since the Turchan Process® is accomplished at the molecular level, the treatment forms a diamond layer within the substrate of the treated part, thus eliminating the problem of adhesion that plagues other diamond-coating technology. The Turchan Process® also hardens the treated substrate supporting the newly-formed diamond surface, which provides additional benefits to the treated workpiece.

The Turchan Process® can produce surfaces that are super-abrasive or exhibit high lubricity. The Process does not require a vacuum chamber and it can be localized by using an articulated robotic arm to manipulate the target part. Although parts are treated individually in serial production, integrating automation into the Process enables T-Tech to achieve production rates as high as 10,000 parts per hour. Below is a depiction of the Turchan Process®, along with electron microscopy photographs of actual treated surfaces.





The Turchan Process® has diverse applications in many industrial and commercial markets, including cutting and metal forming tools, biomedical devices, electronics, food processing, sporting goods and other wear-parts. The Office of Naval Research (ONR) engaged T-Tech to develop an advanced material for critical nuclear submarine components. Additional applications for T-Tech's laser-synthesis technology are being developed for and/or applied by Parker Hannifin, DCX, Delphi and Johnson & Johnson.

T-Tech recently developed a diamond electroplating facility for producing unique diamond-coated dental burs with discretely arranged diamond crystal patterns to reduce noise, heat and build up while simultaneously improving efficiency. This technology has potential application to a panoply of medical and dental instruments.

Turchan affiliated companies already hold over 100 patents worldwide with numerous licensees for proprietary processes and technology. The company's vision is relentless development of new and exciting processes to enable new and improved products through its technological breakthroughs.