
TITLE: Finish Machining of Ceramics Matrix Composite with PCD Endmills

RELATED ROAD-MAPPING DESIGNATION ID#: M50

SUPPORTIVE INDUSTRY: Mitsubishi, Kennametal, Heidenhain, Boeing

PROJECT TYPE: General Project

PROBLEM STATEMENT (What Are We Trying to Solve?): With a focus on Aerospace components such as engine parts made of Ceramics Matrix Composite (CMC), this research focuses its investigation on exploring the best performance from PCD-brazed carbide endmills, or any other recommend endmill solution. Ultimately this research is about building confidence in the use of additively manufactured parts so that they can be deployed as production ready components that meet customer needs.

PROJECT DESCRIPTION: This project carries with it a very specific focus as outlined below:

- In partnership with the respective supportive industry, a facsimile CMC aerospace part will be agreed upon. This part will then be built by an agreed upon additive manufacturing process.
- The focus of the research is specific to endmills that would be tested in performing side-milling (aka profiling) operations only.
- The research conducted on the Solid Carbide Endmills (or brazed-endmills), should show the following:
 - o Optimal cutting geometries
 - o Optimal tool substrate and coating materials
 - o Optimal operating parameters
 - o Tool life
 - o Surface finish of machined part
 - o Dimensional accuracy of part
 - o All tests would be repeated 3 times to demonstrate a reliable process

Identify Related OMIC R&D Resources: Proposing researchers should use their best judgment in deciding on the optimal resources for the research. To further aid in this decision, the OMIC staff has taken the initiative to best identify on-site resources (machines, equipment, and staff) that may relate to the scope of this research. Please recognize that researchers are not limited to these resources.

- Machines and equipment at OMIC can be reviewed at:
<https://www.omic.us/explore/facility>
- OMIC Staff or SMEs

PROJECT DELIVERABLES:

- Final report
- Final presentation
- All built parts
- Cutting tools used

SPECIAL NOTE: It should be recognized that this Conceptual Abstract is written based on comments collected during OMIC R&D Road-mapping workshop and based on industries need for applied research. However, researchers as SMEs, are encouraged to lend specific technical feedback to further refine the Project Description and/or Project Outcomes. The proposing researcher may do so either directly to OMIC R&D, or in the submitting proposal.

UTILIZATION OF OMIC RESOURCES: Researchers are encouraged to utilize the capital and personnel resources available on the OMIC R&D campus in their proposals. Use of OMIC time and machines should be included in the Proposal funding request. If use of OMIC resources are not identified in a proposal and are requested during, the project sponsor will be responsible for requesting a costed project amendment from the Tech Board.

PROJECT UPDATE EXPECTATIONS: Researchers are required to have monthly update discussion with OMIC R&D to provide a summary update on project status. This is done by way of a user-friendly format known as the OMIC 6-Block update. Typically, these meetings are scheduled on the first Wednesday and Thursday of each month. Secondly, depending on the scope of the project, OMIC R&D's industry Tech Board representatives are often interested in periodic project updates, and even in project participation. Researchers are required to communicate with supportive industry and facilitate communications as required.

OMIC R&D TECHNOLOGY BOARD CONCEPTUAL ABSTRACT



ADDITIONAL COMMITMENTS TO FACTOR: Researchers may be asked to present their final project at an OMIC R&D biennial Technology Exchange Symposium. This symposium is an in-person event, held at the OMIC R&D campus in Scappoose Oregon. The Symposium is held in April, and researchers should factor in their availability when bidding on projects.

Researchers may be invited to participate in OMIC R&D’s marketing efforts that showcase the working history of the project.

PROJECT DURATION: Its OMIC R&D’s strong preference that duration of a General Project aligns with the academic calendar cycle (July 2024 to June 2025). It is preferred that the project be completed by June 2025. Researchers are encouraged to factor in variables such as contracting, student hiring (if needed), procurement, holidays, and travel. It has been OMIC R&D’s experience that a project’s useful working duration is typically 9 to 10 months. Researchers are also encouraged to give feedback, and to adjust the scope of work to best fit this preferred timeframe. Additionally, it is reasonable to even recommend phasing breakdowns to the project. In some unique circumstances, if the project is to take significantly longer than the duration of the academic year, this reasoning should be explicitly explained in the proposal.

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