

E-LEARNING

CERTIFIED METALCUTTING PROFESSIONAL (CMP) PROGRAM



Milling Tool Selection 2

Lesson 2

Lesson Images

Greater Radial Cutting Forces

Greater Axial Cutting Forces

Figure 1. As the lead angle increases, radial forces decrease and axial forces increase.

Force

Height

Base

Force

Height

Figure 2. A low lead angle directs the lead forces radially into a thin portion of workpiece material, while a higher lead angle directs the lead forces axially into a thicker portion of workpiece material.

Milling Tool Selection 220

Lesson 4 of 25

Face Milling Selection Variables

Compared to other metal cutting processes, milling cutter selection is more complex because of the many variables involved with the process. Most of these variables involve the geometry of the cutter. Figures 1-3 identify a few of these geometric variables. You can control the selection process by learning about the following variables, which are important geometric components in milling.

- **Lead angle** is the approach angle of the cutting edge as it enters the workpiece. The lead angle controls the direction of the resultant cutting force and axial cutting force.
- **Rake angle** is the angle of the top surface of the cutting edge that makes contact with the chip. The rake controls the degree of cutting forces and cutting edge strength.
- **Clearance angle** is the angled lead behind the cutting edge that eliminates interference between the cutting tool and the workpiece.
- **Cutter diameter** is the overall diameter of the cutter body. The proper cutter diameter is dependent upon the workpiece, including its extension and finishing.
- **Insert depth** is the distance between corresponding positions on one insert to the same position on the subsequent insert.
- **Insert diameter** is the number of inserts, or cutting edges, per in. of diameter.
- **Head of tool** determines the direction of the cutter rotation. Milling cutters are designed to cut clockwise or counterclockwise.
- **Mounting adaptation** determines the type of machine spindle on which the rotating cutter is mounted. The method of mounting is a major factor in determining the rigidity and performance capability of the cutter.

My Notes

Add any notes for this lesson below (notes are automatically saved).





GOAL: To advance the metalcutting profession and to recognize its practitioners. A CMP (Certified Metalcutting Professional) designation following your name communicates that you possess a solid foundation of metalcutting experience and education! Our course provides the essential preparation necessary to pass Kennametal's CMP exams — ultimately resulting in your CMP certification.

Dramatically improve profitability, productivity, and part quality with the knowledge you'll gain from the Kennametal CMP program. The program includes:

- clearly defined class outlines and objectives
- interactive note-taking
- pop-up definitions for all technical terminology
- tools to easily track your course progress

ALL COURSES ARE ONLINE — AND AVAILABLE 24/7 USING THE LATEST E-LEARNING TECHNIQUES AND FORMAT!

EDUCATION CONTENT

Our CMP program clearly and concisely explains the metalcutting process and provides defined and common tool-selection criteria based on proven cause and effect relationships among three categories of tool design and application factors.

CMP courses are divided into three sections:

1. ENGINEERING PRINCIPLES — Identifies tool design features and application factors used to effect change in tool performance. Common terminology used for all metalcutting tools, all processes, is established.

Five courses are included:

- Mechanics of Metalcutting
- Cutting Edge Materials
- Operating Conditions, Tool Life, Productivity
- Tool Failure Analysis
- Surface Finish

2. TURNING PROCESSES — How to apply the Engineering Principles selection criteria to Lathe and Turning Center applications.

Six courses are included:

- Toolholder Selection
- Boring Bar Selection
- Insert Selection
- Grooving Tool Selection
- Cut-Off Tool Selection
- Single-Point Threading

3. MACHINING CENTER PROCESSES — How to apply the Engineering Principles selection criteria to Machining Center applications.

Four courses are included:

- Face Mill Selection
- End Mill Selection
- Drill Selection
- Tap Selection

WHO SHOULD ATTEND?

CMP is specifically designed for the working engineer and other metalcutting professionals involved in tool management, tool selection, process optimization, CNC programming, and trouble-shooting.

INSTRUCTION

All courses are online — and available 24/7 using the latest e-learning techniques and format. Graphics and videos support all course content.

CERTIFICATION REQUIREMENTS

Testing follows completion of each course. To qualify for certification, you must score 80% or higher per test. Final exams may be retaken if, on first try, you do not meet the 80% score. However, you must complete all courses and exams within one year.

Professionals who receive CMP certification must also complete the Continuing Certification Requirements program.

REGISTRATION INFORMATION

English ANSI, English ISO, German ISO, French ISO, Spanish ISO, Italian ISO, and Chinese ISO versions are available. Your registration will give you complete access to all courses for one year from when you start the program.

TO REGISTER, VISIT www.kennametal.com

Click on the “Resources” tab, then click on the “Training” link.

YOUR E-LEARNING CENTER CONTACTS

Asia Pacific:

Tel: +86 21 38608358

E-mail: k-ap-knowledge.center@kennametal.com

Germany:

Tel: +49 911 9735 299

E-mail: k-de-knowledge.center@kennametal.com

India:

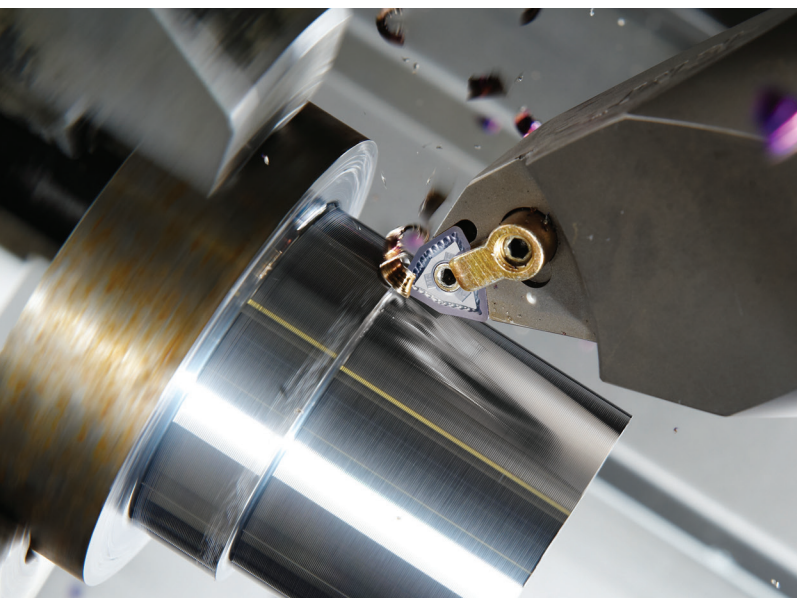
Tel: +91 80 28394321

E-mail: k-in-knowledge.center@kennametal.com

North America:

Tel: +1 724 539 2979

E-mail: k-na-knowledge.center@kennametal.com





WORLD HEADQUARTERS

Kennametal Inc.

1600 Technology Way

Latrobe, PA 15650

USA

Tel: +800 446 7738 (United States and Canada)

E-mail: ftmill.service@kennametal.com

EUROPEAN HEADQUARTERS

Kennametal Europe GmbH

Rheingoldstrasse 50

CH 8212 Neuhausen am Rheinfall

Switzerland

Tel: +41 52 6750 100

E-mail: neuhausen.info@kennametal.com

ASIA-PACIFIC HEADQUARTERS

Kennametal Singapore Pte. Ltd.

3A International Business Park

Unit #01-02/03/05, ICON@IBP

Singapore 609935

Tel: +65 6265 9222

E-mail: k-sg.sales@kennametal.com

INDIA HEADQUARTERS

Kennametal India Limited

CIN: L27109KA1964PLC001546

8/9th Mile, Tumkur Road

Bangalore - 560 073

Phone: +91 080 22198444 or +91 080 43281444

E-mail: bangalore.information@kennametal.com

www.kennametal.com