

FUNDAMENTAL MANUFACTURING PROCESSES

Milling & Machining Centers

SCENE 1.

ML24A, CGS: CNC Machining Centers
white text, centered on background

SCENE 2.

ML25A, SME4018, 02:09:10:00-02:09:36:00
zoom in, cnc control running machining
operation

NARRATION (VO) :

PRODUCTION MACHINING CENTERS USE
COMPUTER NUMERICAL CONTROL, IN WHICH
INSTRUCTIONS FOR MACHINING ARE IN THE
FORM OF A CODED PART PROGRAM. THE
MACHINE'S COMPUTER TRANSLATES THIS
PROGRAM INTO SIGNALS TO THE MACHINE'S
AXIS MOTORS TO ACTIVATE THE MOTIONS
NEEDED TO MACHINE A PART.

SCENE 3.

ML26A, SME4022, 07:16:35:00-07:16:52:00
zoom in, high speed machining
ML26B, SME4091, 07:24:36:00-07:24:43:00
milling of transmission housing
ML26C, SME4091, 07:26:20:00-07:27:02:00
drilling and tapping of transmission
housing, edit at multiple points

NARRATION (VO) :

'CNC' MILLING HAS OBVIOUS ADVANTAGES
OVER MANUAL MILLING FOR PRODUCTION WORK.
FIRST, A SINGLE 'CNC' MACHINE CAN
PERFORM MULTIPLE CUTTING OPERATIONS
WITHOUT REQUIRING A WORKPIECE TO BE
MOVED FROM ONE MACHINE TO ANOTHER, OR
RECLAMPED.

SCENE 4.

ML27A, SME4018, 02:17:00:00-02:17:20:00
fast cnc cutting
ML27B, FMP007, 07:19:46:00-07:20:34:00
zoom in, machining parts, all alike

NARRATION (VO) :

'CNC' MACHINES CAN CUT MUCH FASTER THAN
MANUAL MILLS, AND THEY WORK WITH GREAT
CONSISTENCY AND REPEATABILITY, WITH NO

OPERATOR-INDUCED VARIATION. THE SAME MACHINE MOTIONS ARE REPEATED PART AFTER PART.

SCENE 5.

ML28A, SME4029, 16:24:05:00-16:24:17:00
software being used

ML28B, SME4030, 17:35:30:0-17:35:57:00
zoom in, esprit software being used

NARRATION (VO) :

FINALLY, 'CNC' PROGRAMS CAN BE DEVELOPED AND VERIFIED GRAPHICALLY TO ENSURE THAT TOOLPATHS ARE CORRECT BEFORE METALCUTTING BEGINS. IMPROVED GRAPHICAL USER INTERFACES AND SIMPLIFIED PROGRAMMING SOFTWARE ALLOWS OPERATORS TO VISUALIZE HOW A PART WILL BE MILLED -- EVEN BEFORE PARTS OR TOOLS ARE PLACED INTO THE MACHINE.

SCENE 6.

ML29A, SME4026, 11:48:29:00-11:48:55:00
zoom out, cnc machining center, milling part

ML29B, SME4026, 11:57:01:00-11:57:12:00
zoom out, parts

NARRATION (VO) :

BECAUSE OF THEIR PRODUCTIVITY AND FLEXIBILITY, 'CNC' MACHINING CENTERS ARE THE PRIMARY MACHINES FOR MILLING AND HOLEMAKING, PARTICULARLY FOR NON-ROUND, OR PRISMATIC, WORKPIECES.

-- TOUCH BLACK --

SCENE 7.

ML30A, FTD99, 09:30:27:00-09:30:48:00
zoom out, vertical machining center

ML30B, SME3353, 10:10:42:00-10:10:57:00
zoom out, horizontal machining center

NARRATION (VO) :

THE TWO MAIN TYPES OF MACHINING CENTERS ARE THE VERTICAL SPINDLE MACHINING CENTER..., AND THE HORIZONTAL SPINDLE MACHINING CENTER.

--- TOUCH BLACK ---

SCENE 8.

ML31A, CGS: Vertical Machining Center
ML31B, **F7D11**, **10:04:29:00-10:05:10:00**
zoom out, wide, vertical machining center
ML31C, CGS: X Axis
ML31D, CGS: x axis arrows
ML31E, CGS: Y Axis
ML31F, CGS: y axis arrows
ML31G, CGS: Z Axis
ML31H, CGS: z axis arrows

NARRATION (VO) :

VERTICAL MACHINING CENTERS, OR VMC'S,
HAVE THE SPINDLE ORIENTED VERTICALLY,
AND HAVE THREE LINEAR AXES OF MOTION:
THE 'X' AXIS, WHICH IS THE TABLE'S
MOTION SIDE TO SIDE...,
THE 'Y' AXIS, WHICH IS THE TABLE'S
MOTION IN AND OUT...,
AND THE 'Z' AXIS, WHICH IS THE HEAD
MOVEMENT UP AND DOWN THE COLUMN.

SCENE 9.

ML32A, **FMP006**, **06:31:46:00-06:32:02:00**
zoom in, milling on vertical mill

NARRATION (VO) :

VMC'S MAY BE PREFERRED OVER HORIZONTAL
MACHINING CENTERS WHEN WORK IS DONE
PRIMARILY ON A SINGLE WORK FACE.

SCENE 10.

ML33A, **FMP004**, **04:43:57:00-04:44:27:00**
parts indexed to new work surface
ML33B, **FMP003**, **03:09:43:00-03:10:10:00**
indexer on vmc
ML33C, **SME4030**, **17:21:27:00-17:21:50:00**
zoom in, high speed machining, part
rotating while machined
ML33D, CGS: B Axis
ML33E, **SME4018**, **02:17:16:00-02:17:38:00**
high speed machining, part rotating while
machined

NARRATION (VO) :

WHEN A ROTARY TABLE OR INDEXER IS ADDED
TO THE VMC MACHINE TABLE, MORE THAN A
SINGLE SIDE OF A WORKPIECE OR A
MULTIPLE-PART SETUP CAN BE MACHINED
WITHOUT OPERATOR INTERVENTION. ROTARY
DEVICES EITHER INDEX THE PART TO PRESENT
A NEW WORK SURFACE TO THE SPINDLE, OR
THEY ROTATE IT, UNDER FULL 'CNC'
CONTROL, WHILE THE PART IS MACHINED.
VMC'S WITH SUCH A DEVICE HAVE A FOURTH

ROTARY AXIS OF MOTION, DESIGNATED THE
'B' AXIS.

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SCENE 11.

ML34A, CGS: Horizontal Machining Center
ML34B, **SME2973**, **13:10:47:00-13:11:12:00**
zoom in, chips produced from milling
operation
ML34C, **FMP012**, **12:43:42:00-12:44:08:00**
zoom out, hmc operating

NARRATION (VO) :

HORIZONTAL MACHINING CENTERS, OR HMC'S,
HAVE HORIZONTAL SPINDLES; THUS THEY ARE
PREFERRED FOR HEAVY, BOXY PARTS. CHIPS
ARE CLEARED MORE EASILY WITH A
HORIZONTAL MACHINE THAN ON A VERTICAL
MACHINE, AND MORE AUTOMATED WORKHOLDING
OPTIONS MAY BE POSSIBLE.

SCENE 12.

ML35A, **FTD99**, **09:35:53:00-09:36:36:00**
zoom in, horizontal machining center
ML35B, CGS: X Axis
ML35C, CGS: x axis arrows
ML35D, CGS: Z Axis
ML35E, CGS: z axis arrows
ML35F, CGS: Y Axis
ML35G, CGS: y axis arrows

NARRATION (VO) :

HMC'S COME IN A VARIETY OF DESIGNS FOR
MACHINE MOTIONS. BUT IN ITS MOST COMMON
ARRANGEMENT, AN HMC'S TABLE MOVEMENT
SIDE-TO-SIDE IS DESIGNATED THE 'X'
AXIS...,
ITS MOVEMENT IN-AND-OUT IS THE 'Z'
AXIS...,
AND ITS HEAD MOVEMENT UP AND DOWN THE
COLUMN IS THE 'Y' AXIS.

SCENE 13.

ML36A, **FTD99**, **09:40:40:00-09:40:52:00**
horizontal fixture rotating

NARRATION (VO) :

AN HMC'S TABLE TYPICALLY ROTATES TO
ALLOW A CUTTING TOOL TO ACCESS FOUR
SIDES OF THE WORKPIECE OR FIXTURE.

--- FADE TO BLACK ---

