DMG MORI Technology Cycles

Complex machining easily realized

www.dmgmori.co.jp
New solutions making complex machining simpler and quicker

DMG MORI Technology Cycles

Technology Cycles are advanced solutions that combine machine bodies such as highly evolved simultaneous 5-axis machines, mill-turn machines, laser/ultrasonic machines, and additive manufacturing machines with peripheral equipment including cutting-edge tools, measuring instruments, robots and sensors as Open Innovation, aiming to boost customers’ productivity. The solutions use DMG MORI’s original high-quality embedded software and the ERGoline + CELOS, a human-machine interface with outstanding operability.

CELOS + Industry 4.0

DMG MORI achieves "Industry 4.0" Integration of production systems and whole production planning with CELOS. We promote "Smart Factory" in an effort to boost efficiency of every production process.

Technology Cycles highlights

+ Easy-to-understand "operation + macro programs" and "conversational programming function" that are full of DMG MORI’s machining know-how.

+ Cutting-edge technologies applied to machine tools enabling shorter setup and machining times, sophisticated measurement, and higher maintainability and safety performance.

DMG MORI SYSTEMS

We analyze customers’ production conditions to provide meticulous support from consultation and planning to installation, offering automation systems such as gantry loaders, robots and pallet pool systems; flexible production cells; and comprehensive solutions for mass production.

DMG MORI Technology Cycles

Watch the video on the DMG MORI Technology Cycles
Holistic solutions

Technology cycles are optimum solutions to support each production process.

Handling
- Retraction cycle
- Tailstock for turret
- Steady rest for turret
- Counter spindle tip
- Tool sort cycle

Shaping
- DMG MORI gearMILL
- gearSKIVING
- Multi-threading
- Eccentric machining
- Interpolation turning
- Alternating speed
- Grinding
- Gear hobbing
- ATC (Application Tuning Cycle)
- Efficient Production Package

Measuring
- 3D quickSET
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- DMG MORI Dynaline
- L-measuring probe package

Monitoring
- MPC (Machine Protection Control)
- MVC (Machine Vibration Control)
- Easy tool monitoring
Handling

Retraction cycle

Simplifying setups

Customer issues
+ Complicated manual operation in setups
+ Interference caused by manual operation mistakes

Solved by “Retraction cycle”
+ Axes can be retracted to a specified position safely in one-touch operation

Main applicable models: NLX, NZX, NVX, NHX, NTX, DMU 50 (FANUC), CTX, CTX 4A, CTX TC / TC 4A, SPRINT 50 / 65

Handling

Tailstock for turret

Mounting the tailstock on Turret 2

Customer issues
+ Hope to machine long workpieces on machine with Headstock 2
+ Programming is complicated with the tailstock mounted on Turret 2

Solved by “Tailstock for turret”
+ Simple operation by the guidance screen
  - Setting of tailstock pressures
  - Tailstock movement from the retract position to approach position, and then the workpiece support position
  - Tailstock retraction
+ Two types of tailstocks, fixed and spring types, are available

Main applicable models: NZX 1500 / 2000, NTX, CTX 4A, CTX TC 4A, SPRINT 50 / 65
Handling

Steady rest for turret

Mounting the automatic centering type steady rest on Turret 2

Customer issues

+ Necessary to record a workpiece clamp position and manually input it
+ Creating programs after determining a workpiece clamp position

Solved by “Steady rest for turret”

+ Approach and clamp / unclamp of steady rest can be executed in the same cycle
+ Easy teaching of positions (retraction ⇔ movement ⇔ clamp / unclamp ) in clamped state by button operations

Main applicable models: CTX 4A, CTX TC 4A, SPRINT 50 / 65

Handling

Counter spindle tip

Mounting tailstock on Spindle 2

Customer issues

+ Hope to use Spindle 2 as the tailstock
+ Programming with the tailstock mounted on Spindle 2 is complicated

Solved by “Counter spindle tip”

+ Simple operation for teaching positions of thrust, approach, and retraction
+ Automatic tailstock transfer between Spindle 2 and tool-spindle / turret is possible*
+ Simultaneous operation of the tailstock on Spindle 2 supports long workpieces

* Except NLX, NZX 1500 / 2000, and NTX

Main applicable models: <Machines equipped with Spindle 2>
NLX, NTX, NZX 1500 / 2000, CTX, CTX 4A, CTX TC / TC 4A, CTV, SPRINT 50 / 65
Handling

Tool sort cycle
Minimizing tool calling time

Customer issues
+ Tool calling takes too much time
+ Manual changing of heavy tools takes pains

Solved by "Tool sort cycle"
+ Sorting tools in the chain magazine according to the tool calling order shortens tool call time
+ Standby pot shortens time for selecting tools inside the chain magazine

Main applicable models: CTX TC / TC 4A

Shaping

DMG MORI gearMILL
Integrating gear cutting into turning / milling

Customer issues
+ Multiple devices or dedicated machines are necessary for each process
+ Idle time between processes occurs due to using both a turning center and a machining center

Solved by "DMG MORI gearMILL"
+ PC software for gear cutting
+ All processes of turning, milling, and gear cutting are done on one machine
+ Investment cost can be reduced by use of commercially available tools and general-purpose machines

Main applicable models: NLX, NZX, NVX, NHX, NTX, DMU 50 (FANUC), CTX TC / TC 4A, DMU, DMU / DMC monoBLOCK, DMU eVo, DMF, DMU / DMC (FD) duoBLOCK, DMU / DMC (FD) Portal
Shaping

gearSKIVING

High-speed gear cutting including internal teeth

Customer issues

+ Don’t know how to create programs for the latest machining technology
+ Calculation from multiple data such as gears and tools is troublesome
+ Many changes need to be made in programs when machining conditions are changed

Solved by “gearSKIVING”

+ New machining technology
  “gearSKIVING” can be programmed easily
+ Internal teeth that cannot be machined by hobbing can be cut
+ Machining performed only on a gear machine can be achieved on a general-purpose machine

Main applicable models: NLX, NTX*, NZX*, CTX TC / TC 4A, CTV DF, DMU eVo, DMU / DMC FD duoBLOCK, DMU / DMC FD Portal

* Scheduled to be released in 2017

Shaping

Multi-threading

Cutting special thread

Customer issues

+ Hope to cut special thread
+ Hope to simplify complicated programming

Solved by “Multi-threading”

+ Programs for cutting various thread shapes can be created using the conversational programming style
+ Special threads can be cut without CAD / CAM

Main applicable models: NLX*, NZX*, NTX*, NEF, CTX, CTX 4A, CTX TC / TC 4A, CTV, SPRINT 50 / 65

* Scheduled to be released in 2017
**Eccentric machining**

Easy programming of eccentric machining

**Customer issues**

- Hope to perform eccentric machining processes on one machine
- Expensive jigs for eccentric machining are necessary

**Solved by “Eccentric machining”**

- Machining processes which used to be done by dedicated machines can be performed on one machine
- Complicated program for eccentric machining can be created using the conversational programming style
- Available for both turning and milling

**Main applicable models:** NLX, NZX\(^a\), NTX\(^a\), CTX, CTX TC / CTX TC 4A, CTV, SPRINT 50 / 65, CTX 4A, DMU / DMC monoBLOCK, DMU / DMC FD duoBLOCK, DMU / DMC FD Portal

* Scheduled to be released in 2017

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**Interpolation turning**

Easy programming of interpolation turning

**Customer issues**

- Hope to create interpolation turning programs
- Hope to perform turning even if the center of a cylindrical workpiece is shifted
- Hope to perform turning on a machining center without turning function

**Solved by “Interpolation turning”**

- Interpolation turning can be programmed using the conversational programming style
- O-ring groove and sealing surface can be cut
- Processes can be integrated by using turning function of machining center

**Main applicable models:** NVX\(^a\), NHX\(^a\), NTX\(^a\), DMU 50 (FANUC)\(^a\), CTX TC / CTX TC 4A, DMC V, DMC H duoBLOCK, DMC H linear, DMU / DMC monoBLOCK, DMU eVo, HSC linear, DMF, DMU / DMC (FD) duoBLOCK, DMU / DMC (FD) Portal, MILLTAP 700

* Scheduled to be released in 2017
### Alternating Speed

Stable machining in which chatter hardly occurs

**Customer issues**
- Chatter occurs when using tools under its recommended conditions
- Vibration in deep hole drilling using a long drill should be suppressed

**Solved by “Alternating speed”**
- Chatter can be minimized by periodical spindle speed changes
- Surface quality is improved

**Main applicable models:** NLX®, NZX®, NTX®, NEF, CTX, CTX TC / CTX TC 4A, CTV, SPRINT 50 / 65, DMU eVo, DMF, DMU / DMC FD duoBLOCK

* Scheduled to be released in 2017

### Grinding

Enabling milling, turning, and grinding in one setup

**Customer issues**
- Grinding must be outsourced as we don’t have a grinder
- Hope to improve surface quality by adding grinding processes

**Solved by “Grinding”**
- Programs for dressing and machining can be created using the conversational programming style
- Processes of turning and grinding are integrated

**Main applicable models:** DMU / DMC FD duoBLOCK, DMU / DMC FD Portal
Shaping

**Gear hobbing**

Integrating process of gear cutting machines

- Programming is difficult
- Necessary to understand parameters for hobbing
- Hope to extend tool life of expensive hob cutters

**Customer issues**

**Solved by “Gear hobbing”**

- Programs for hobbing can be easily created using the conversational programming style
- Maximizing tool life of hob cutters by changing the machining position
- Integration of processes that can be performed only on a dedicated machine for gear cutting

**Main applicable models:** NLX, NZX<sup>*</sup>, NTX<sup>*</sup>, CTX, CTX 4A, CTX TC / TC 4A, CTV, SPRINT 50 / 65

* Scheduled to be released in 2017

Shaping

**ATC**

(Application Tuning Cycle)

Easy setting of optimum feed according to the machining operation

- Hope to shorten machining times
- Hope to improve contour of side and pocket milling
- Hope to improve surface quality in die and mold machining

**Customer issues**

**Solved by “ATC”**

- Only by selecting either the time priority mode or accuracy priority mode, smoothness of look-ahead interpolation can be changed
- Feedrate can be changed freely while programs are running, and optimum machining method can be set according to surfaces to be machined

**Main applicable models:** NVX, NHX, NTX, DMU 50 (FANUC), DMC V, DMC H duoBLOCK, DMU / DMC monoBLOCK, DMU eVo, HSC linear, DMF, DMU / DMC (FD) duoBLOCK, DMU / DMC (FD) Portal
Efficient Production Package

Easy inputting of various machining patterns

Customer issues
+ Taking much time to create programs for complicated shapes and many holes
+ Mistakes resulting from large quantity of calculation

Solved by “Efficient production package”
+ Tool path appropriate for high speed machining can be created automatically
+ Guidance input supports programming that is troublesome and makes manuals unnecessary

Main applicable models: NLX, NZX, NVX, NHX, NTX, DMU 50 (FANUC), DMC H duoBLOCK, DMC H linear, DMU / DMC monoBLOCK, DMU / DMC (FD) duoBLOCK, DMU / DMC (FD) Portal

MPC
(Machine Protection Control)

Minimizing load to the spindle when interference occurs

Customer issues
+ Vibration during machining due to tool wear or chipping leads to poor finished surfaces
+ Machine damage due to interference
+ Downtime happens due to spindle bearing malfunction

Solved by “MPC”
+ Advanced sensing technology detects spindle vibrations
+ Monitors tool-spindle vibrations, and stops rotation and feed when value exceeds threshold
+ Reduces spindle damage and overload

Main applicable models: NVX®, NHX®, NTX®, DMU 50 (FANUC)®, CTX TC, CTX TC 4A, DMC V, DMC H duoBLOCK, DMC H linear, DMU, DMC monoBLOCK, DMU eVo, DMF, DMU / DMC (FD) duoBLOCK, DMU / DMC (FD) Portal

* Scheduled to be released in 2017
Monitoring

**MVC**
(Machine Vibration Control)

Selects optimum conditions for preventing chatter

Customer issues

- Difficulty in finding optimum condition for preventing chatter
- Hope to improve machining conditions for existing programs
- Hope to reduce fault workpieces due to chatter on test machining

Solved by "MVC"

- Optimum machining conditions for preventing chatter can be shown and selected
- Optimum machining conditions can be found in one test cutting

Main applicable models: NVX*, NHX*, NTX*, DMU 50 (FANUC)*

* Scheduled to be released in 2017

Easy tool monitoring

Monitoring load of spindle and feed axes

Customer issues

- Load of spindle and tools cannot always be monitored
- Tool damage and machine malfunction should be prevented

Solved by "Easy tool monitoring"

- Load during machining can always be monitored
- Spindle and feed axes can be stopped automatically

Main applicable models: NLX, NZX, NVX, NHX, NTX, DMU 50 (FANUC), NEF, CTX, CTX 4A, CTX TC / TC 4A, CTV, SPRINT 50 / 65
Measuring

3D quickSET

Optimizing accuracy of 5-axis machine at all times

Customer issues

+ Deviation in rotation center of rotation axis should be compensated
+ Hope to compensate position deviation due to thermal displacement or machine aging by ourselves
+ Measurement errors and input mistakes occur by manual operations

Solved by "3D quickSET"

+ Accuracy of 5-axis machine can be checked easily (deviation of rotation axis)
+ Accuracy that may be lowered by external factors can be easily adjusted

Main applicable models: NTX®, DMU 50 (FANUC)®, DMC H duoBLOCK, DMU, DMC H narrow, DMU / DMC monoBLOCK, DMU eVo, HSC linear, DMF, DMU / DMC (FD) duoBLOCK, DMU / DMC (FD) Portal, MILLTAP 700

* Scheduled to be released in 2017

Measuring

W-setter

Manual tool measurement and workpiece centering in simple steps

Customer issues

+ Hope to manually measure tool length without using programs
+ Hope to perform workpiece centering manually using a touch probe
+ Hope that tool length can be measured by even inexperienced operators without trouble

Solved by "W-setter"

+ Measurement can be made simply by turning ON the manual measurement mode, which saves time for setup
+ Operation along guidance screen enables even beginner to perform trouble-free, safe and accurate setups

Main applicable models: NVX, NHX
**Measuring**

**DMG MORI Dynaline**

Easy measurement of tool length, diameter, and run-out

**Customer issues**

+ Hope to accurately measure tool diameters, taking run-out of the tool into consideration
+ Hope to prevent fault workpieces caused by mounting error and tool breakage

**Solved by “DMG MORI Dynaline”**

+ Accurate tool measurement using the CMOS line sensor
+ By measuring run-out of the rotary tool, tool mounting errors and tool breakage can be detected in advance
+ Total solution by open innovation, including peripheral devices and embedded software

*Main applicable models: NVX*

*Scheduled to be released in 2017*

**Measuring**

**L-measuring probe package**

Supporting workpiece measurement inside machine using the L-shaped measuring probe

**Customer issues**

+ Measuring various types of workpiece inside machine
+ Measuring positions such as I. D. grooves and diameters that cannot be reached by a normal probe

**Solved by “L-measuring probe package”**

+ Pockets, grooves, and undercuts can be measured
+ Manual / automatic calibration package for the L-measuring probe

*Main applicable models: DMU / DMC monoBLOCK, DMU eVo, HSC linear, DMF, DMU / DMC (FD) duoBLOCK, DMU / DMC (FD) Portal*