

NIDEC MACHINE TOOL CORPORATION

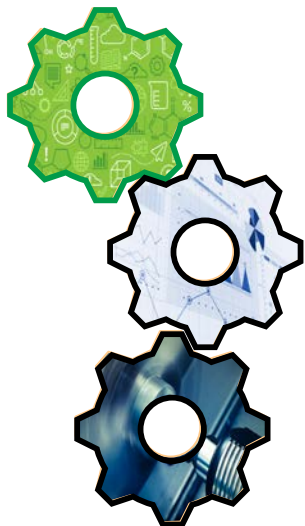
## Entwicklungskräfte im asiatisch-pazifischen Markt für Getriebe und Antriebsstränge / **Evolving Dynamics in the Asia-Pacific Gear and Powertrain Market**

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Eine Branchenperspektive /  
**An industry perspective**

**Adrianos Georgoussis**

**Aachen Conference on Gear Production, 06.11.2024**



**Nidec Innovations**

**APAC Market Perspective**

**Latest Technology**



### ST40B

New guideless gear shaping machine

- 1500 str. / min
- Tilting table
- Gear modifications



### MGC300 and TMX-4000 II ST

New gear skiving machines

- Auxiliary operations
- Tool changer & automation



### Gear Data

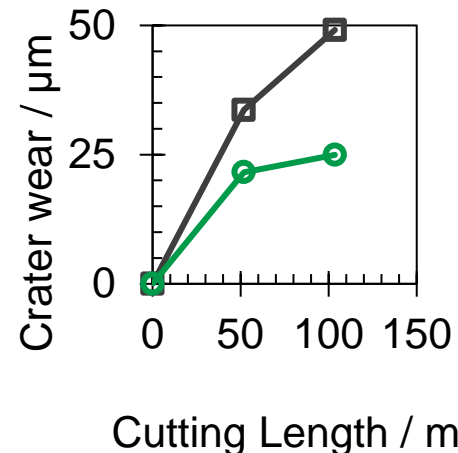
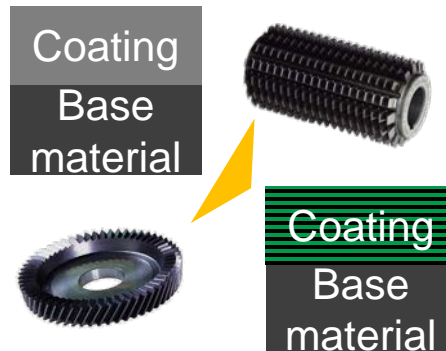
$m_n = 2.25$  mm  
 $a_n = 17.5^\circ$   
 $\beta = 23^\circ$  LH  
JIS SCM420  
DIN 25CrMo4

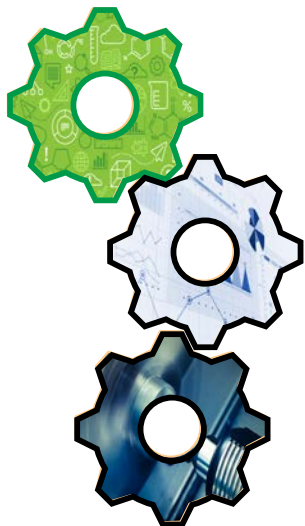
### Tool Data

$z = 3$  -  
 $n_i = 16$  -

### Process Data

$v_c = 300$  m/min  
 $f_a = 2.4$  mm  
Climb cut  
Dry





Nidec Innovations

**APAC Market Perspective**

Latest Technology



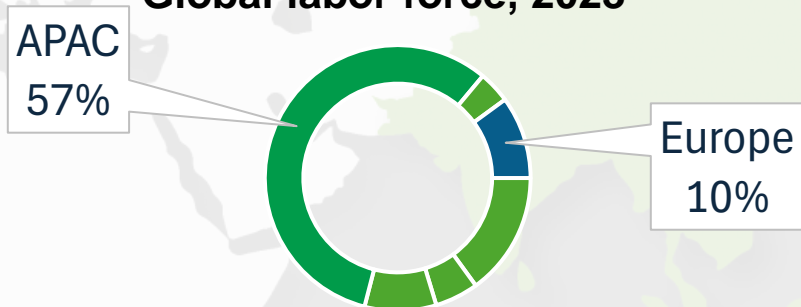
# APAC Market Perspective

## Basic Statistical Data

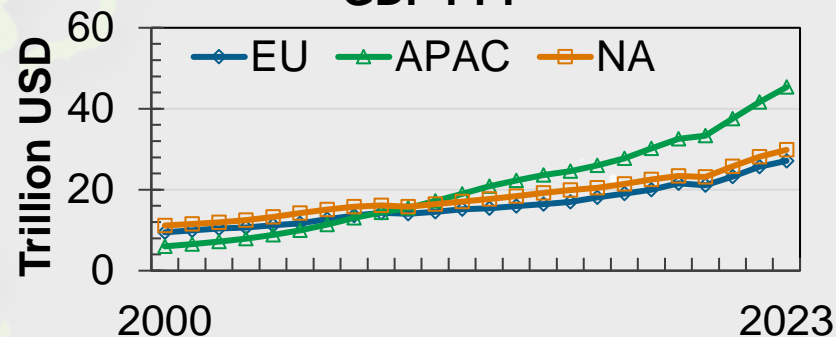


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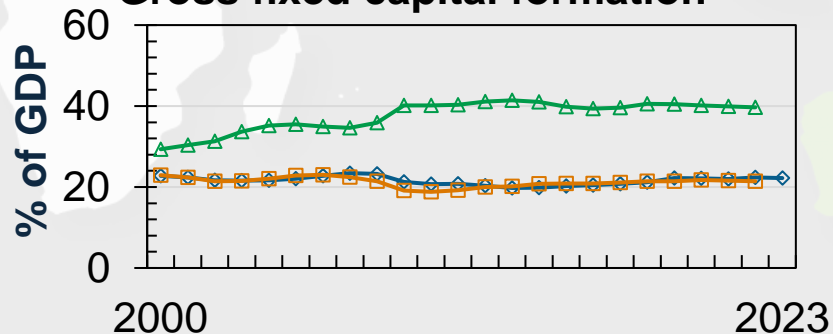
### Global labor force, 2023



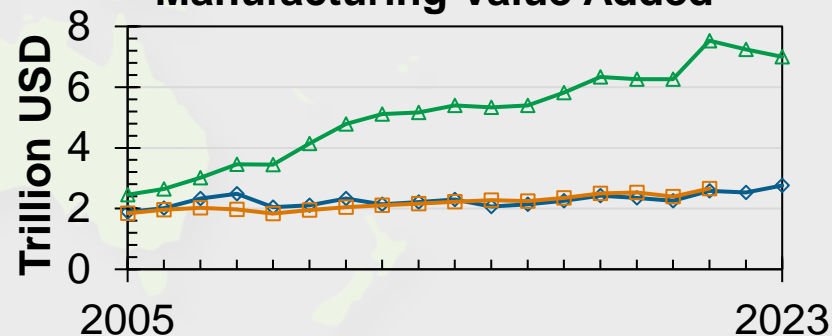
### GDP PPP



### Gross fixed capital formation



### Manufacturing Value Added



# APAC Market Perspective

Gear Manufacturing Market Size to grow between 2024-2028



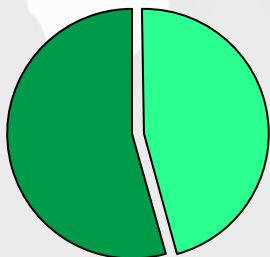
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\$127.7 bn Incremental growth



7.33% Compound Annual Growth Rate



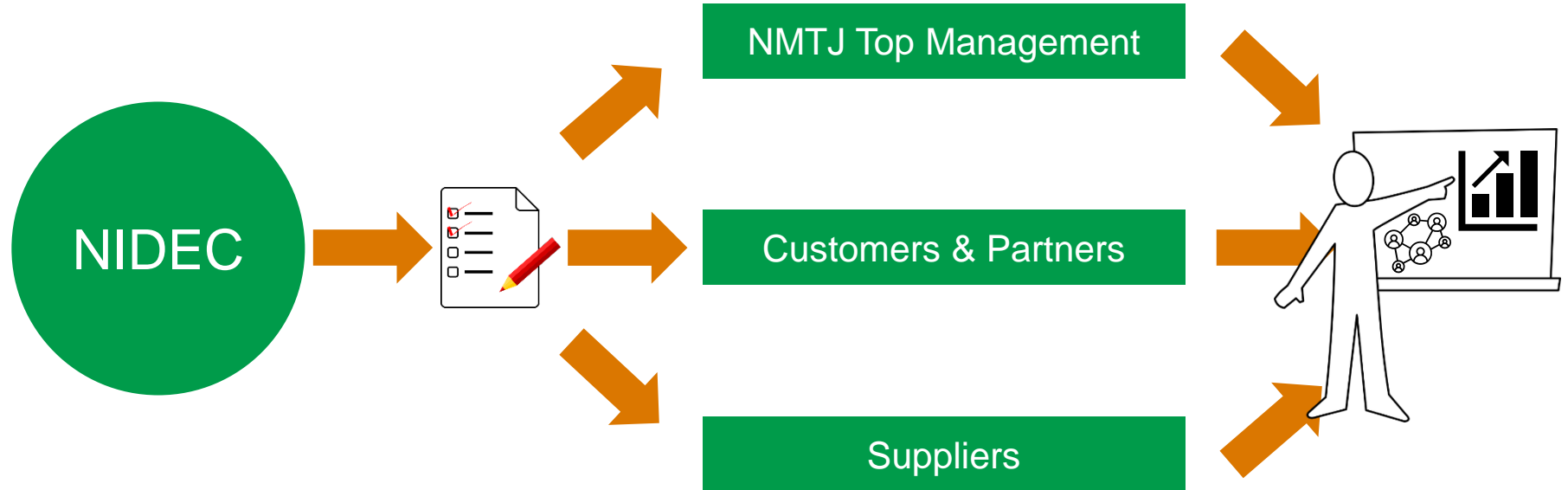
40% of the growth will originate from APAC

# APAC Market Perspective

## Data Source and Data Flow



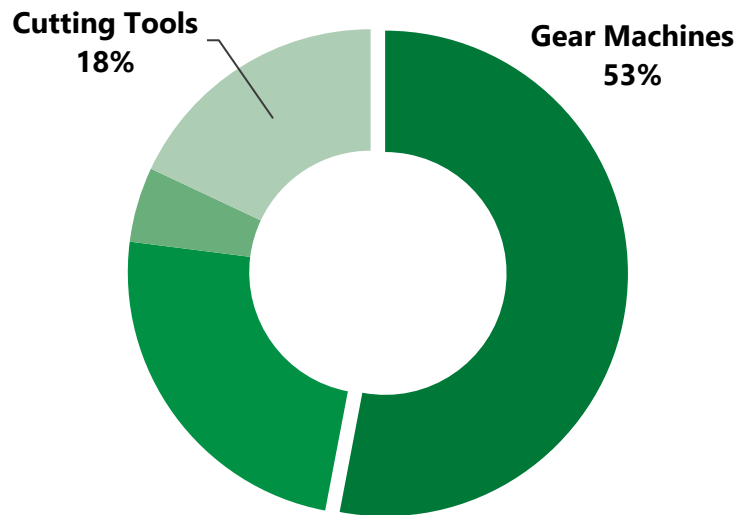
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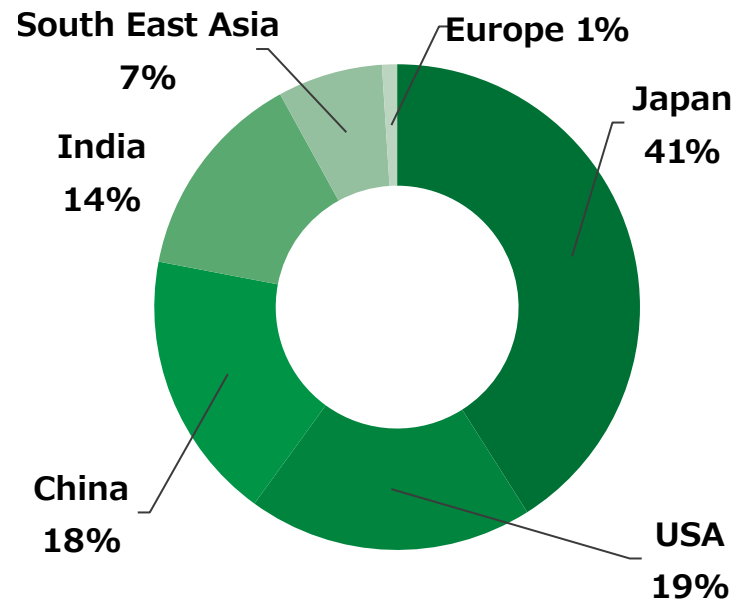




### Sales turnover by product



### Regional sales turnover by region



# APAC Market Perspective

## Geographic Data Source



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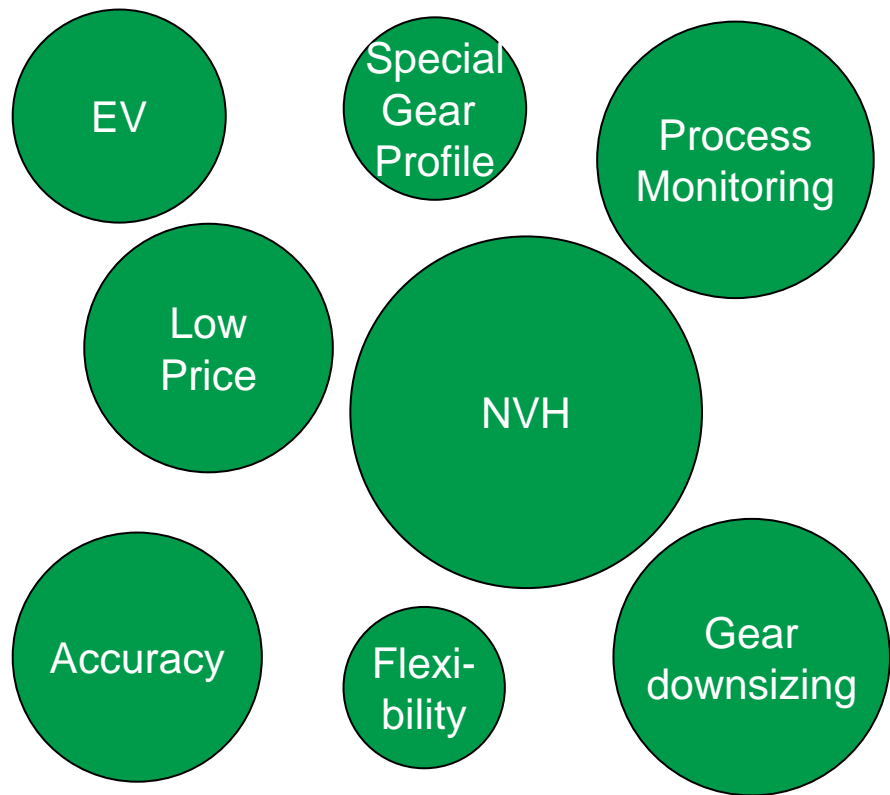


## APAC Market Perspective

Trends currently shaping the gear and powertrain market in APAC



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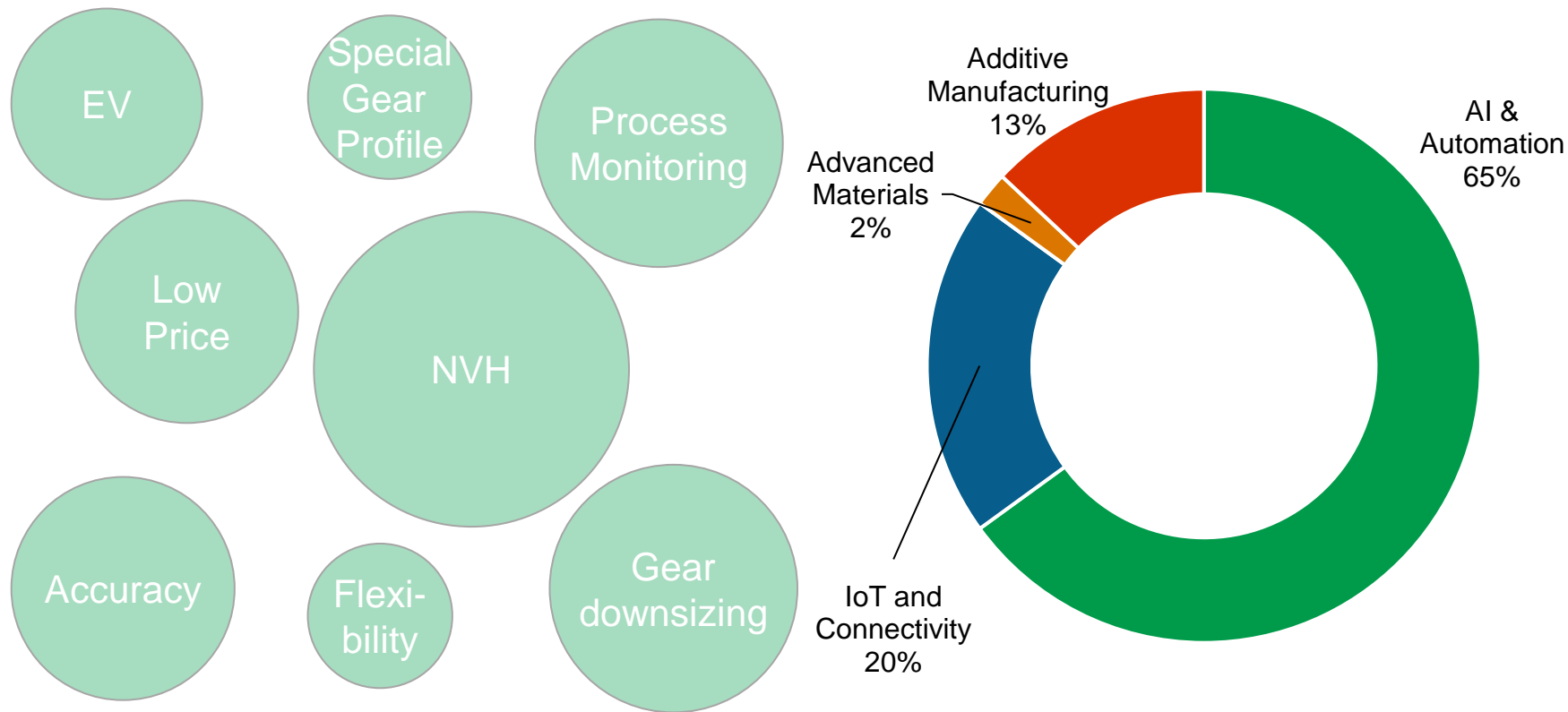


# APAC Market Perspective

Which field will significantly drive innovation in the next 5 years



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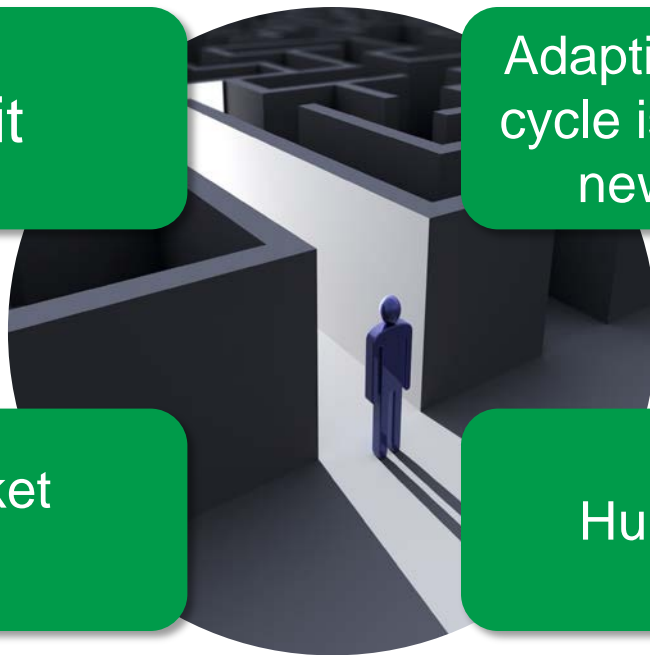


Cost-Benefit

Adaption-Implementation  
cycle is long compared to  
new developments

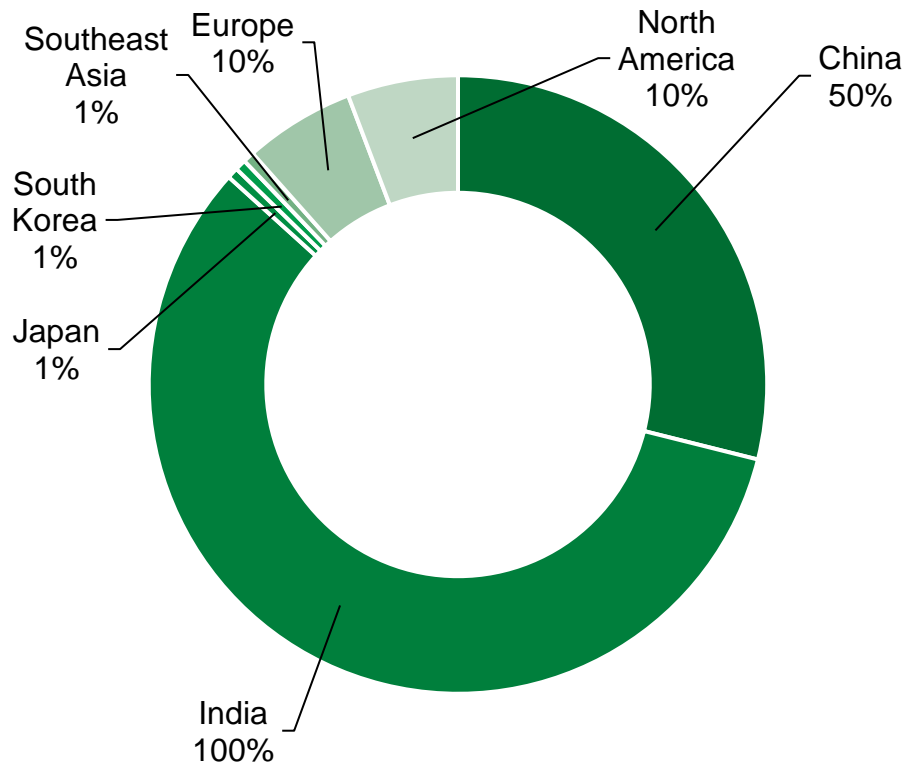
Uncertain market  
conditions

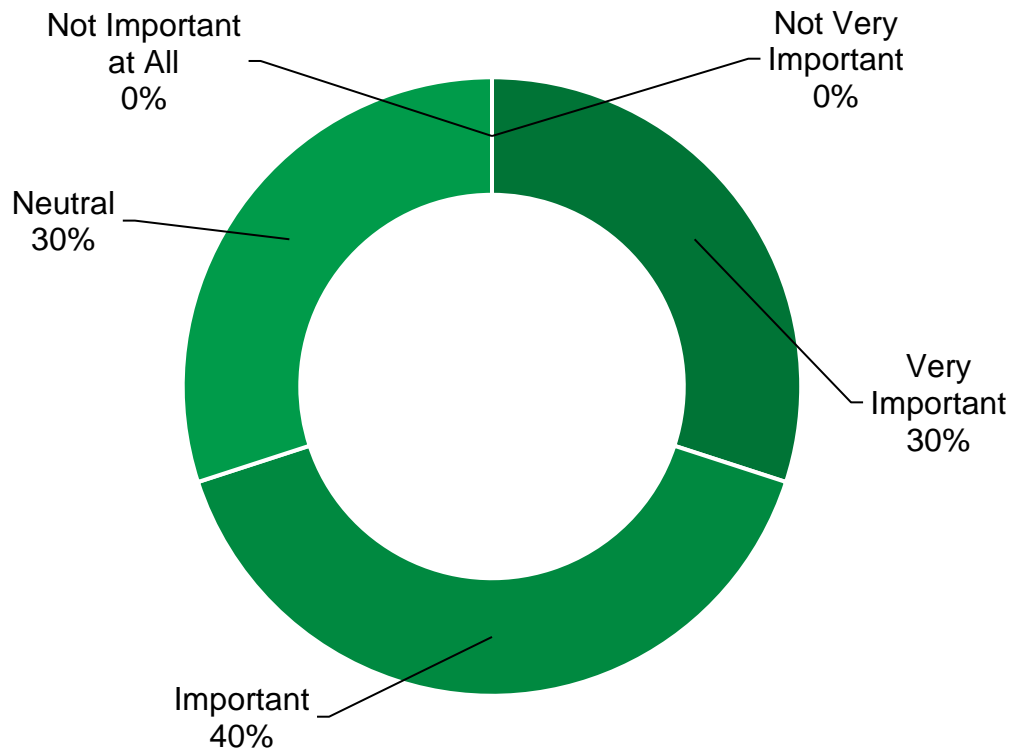
Human Resources



# APAC Market Perspective

Countries with the greatest growth opportunities for your company







There is a huge leap in Indian market for the awareness of quality. Customers have started realizing the importance of quality over cost finally.

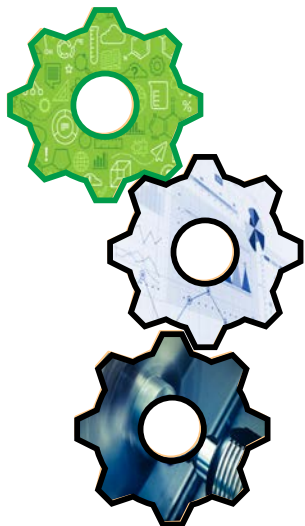
Supply chain management among US, Europe and China is important

The gear market is very nimble & dynamic [...] Gear cutting machine tools need to be updated in very fast changing market & advance technology scenario.

To guarantee high gear accuracy and process stability we need to view gear manufacturing as a system rather than a group of single steps.

There is a lot of wiggle room to utilize and/or integrate simulation tools in the manufacturing space

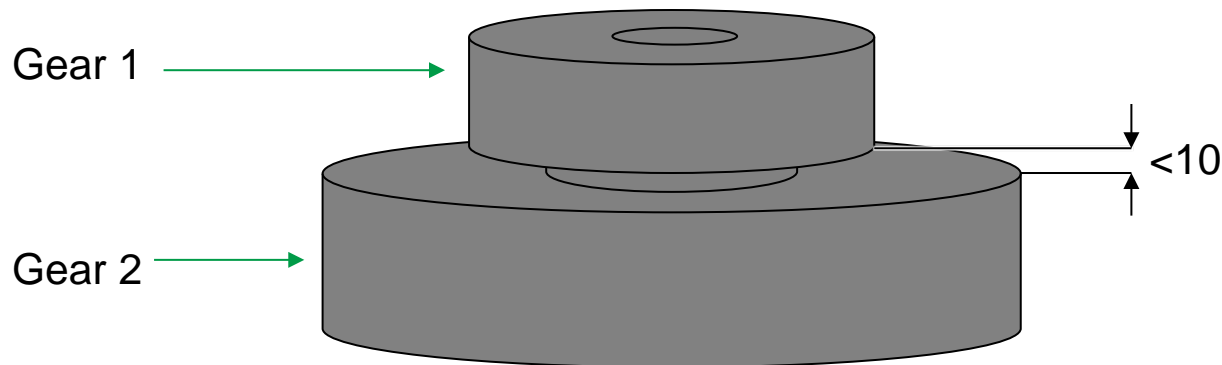




Nidec Innovations

APAC Market Perspective

**Latest Technology**



### Soft Machining

	Gear 1	Gear 2
Gear Hobbing	No	Yes
Gear Shaping	Yes	Yes
Gear Skiving	Maybe	Yes

### Hard Machining

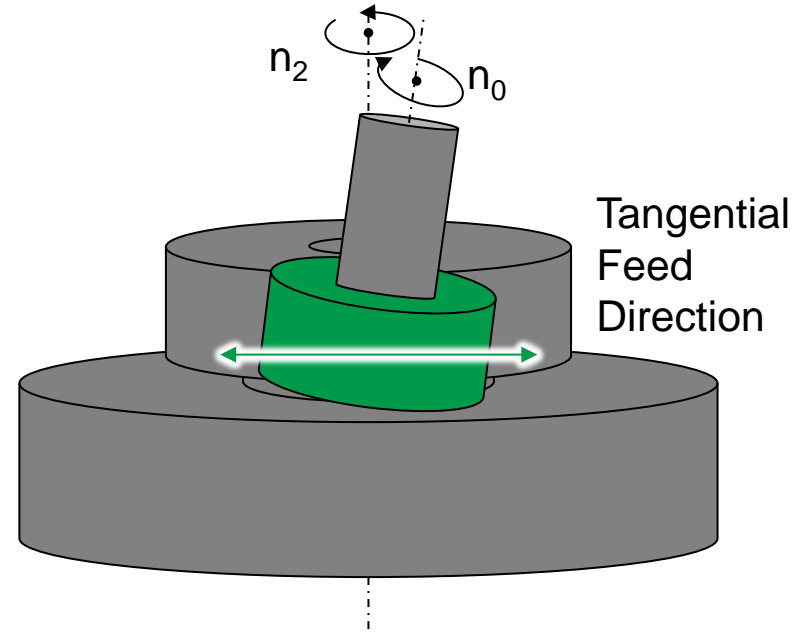
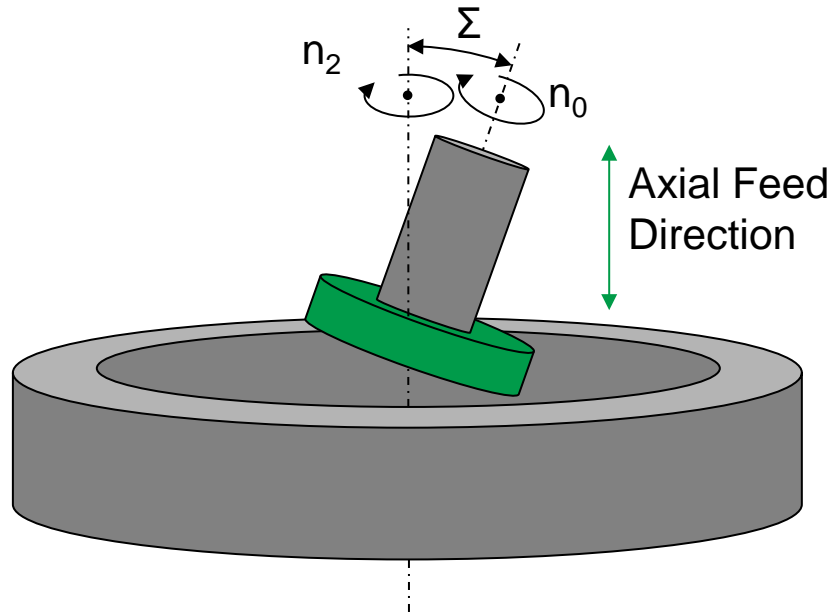
	Gear 1	Gear 2
Gear Honing	Yes	Yes
Profile Grinding	No	Yes
Gen. Grinding	No	Yes

# Latest Technology

## Grinding Gears with the Nidec ZI-Series



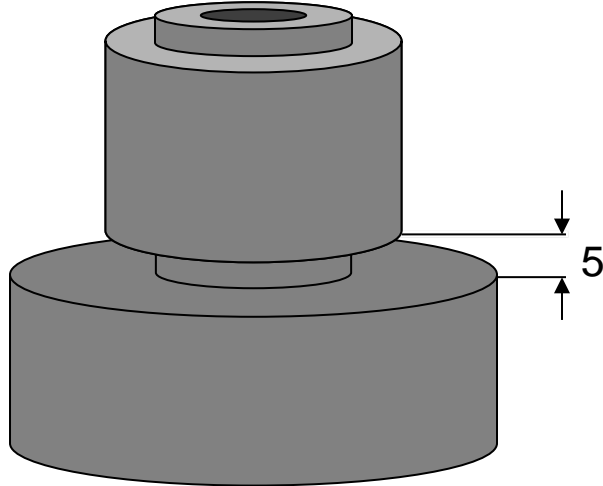
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$\Sigma$ : Axis Crossing Angle

$n_0$ : Tool rotation

$n_2$ : Work rotation



Test Piece

# Latest Technology

## Step Gear Grinding with Nidec ZI-Series



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### Gear Data

$m_n = 1.6$  mm  
 $z = 22$  -  
 $a_n = 21$  °  
 $\beta = 25$  ° LH  
 $q = 0.13$  mm  
HRC 58 - 63  
JIS SCM415  
DIN 15CrMo5



### Tool Data

$z = 67$  -  
 $d_a = 120$  mm  
Noritake  
CZ 120 V 700P

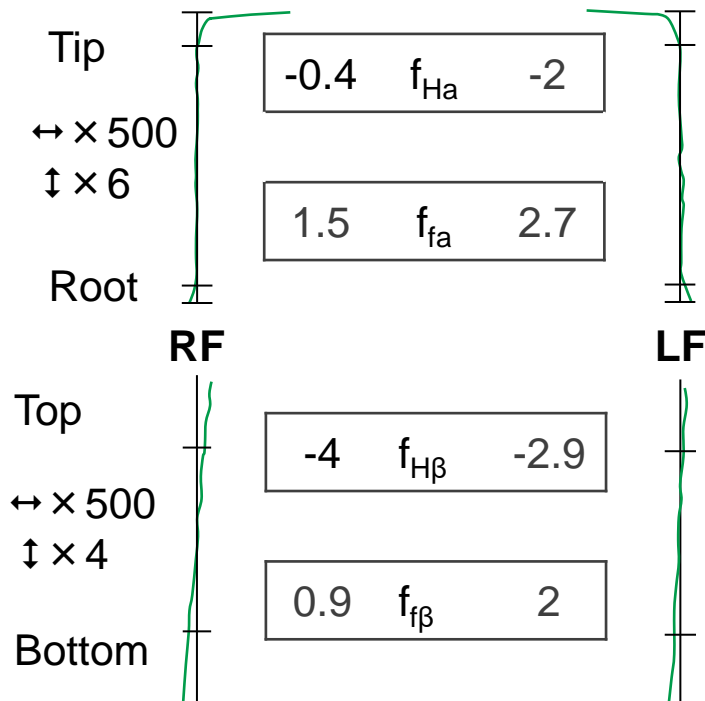
### Dress Data

$n = 300$  rpm  
 $v_f = 4.6$  mm/min

### Process Data

$n = 5500$  rpm  
 $v_f = 5.3$  mm/min  
 $N = 6$  -  
 $\Sigma = 5$  °  
ZI20A - G

### Average of all measured flanks





Now, there is an alternative process to gear honing for gears with interference contours

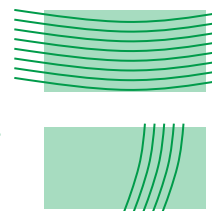
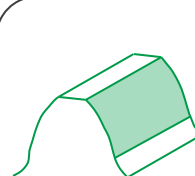
Internal and external gear grinding on 1 machine

Up to 0.15mm stock removal / flank + elimination of heat distortions

Slower process compared to grinding with ZI20 but the risk for thermal damage is very low

Stock removal, profile and lead corrections same performance as grinding with ZI20

Research on residual stress, tool material, and process parameters



Topography influenced by feed direction

Research on influence of the flank topography on the NVH behavior

**We welcome you to visit our machine and check the exhibits**

***Nidec***

**All for dreams**