

Transforming Wind Power Gear Grinding by enhancing efficiency by 25%, Tool life extended by 150%, and surface roughness decreased by 32%:

GARIA® 405 M – 22 AND QH SMART NOZZLES

The Challenge

The gear form grinding process is a critical process in the production of wind power gears. Due to the significant amount of metal removal required, the grinding time for a single gear is relatively long. For instance, grinding the commonly used X6 gear in the wind power industry typically takes over 2 hours. To prevent grinding burns, most manufacturers have to reduce production efficiency, which causes the total production time to more than 2.5 hours.

The customer hopes to improve in the following areas:

- Improve gear grinding efficiency while effectively avoiding grinding burns
- Reduce overall production cost

The Solution

Quaker Houghton expert team conducted deep research on the current status of heat treatment equipment and the performance of grinding oil. By analyzing the grinding oil samples, we concluded that the better effect in cooling and lubrication can be achieved by improving the cooling, lubrication and sedimentation properties of the grinding oil, together with customized smart nozzle solution. Working together with the 3M technical team, we proposed cost-reduction and efficiency-enhancing solution for the technical parameters for customer's grinding process.

- Recommended grinding oil for this process and current production challenges
- Customized smart nozzles based on process requirements and machine tool conditions
- Studied manufacturing process together with the customer, and provided optimization suggestions for rough grinding process

The Benefits

By adapting GARIA®405M – 22 grinding oil plus smart nozzles, the grinding process achieved the following improvement under extreme testing conditions:

- Production efficiency improvement: The production cycle for planetary gears was reduced from 120 minutes to 90 minutes, a 25% increase in efficiency
- Wheel life improvement: Wheel dressing frequency extended from 4 teeth to 10 teeth, a 150% increase in wheel life
- Grinding quality improvement: Vw value increased from 4000 to 11000, without causing grinding burn
- Roughness reduced by 32%, from 0.641 µm to 0.475 µm

Microscopic comparison of grinding wheel surface



Before



After

Process and Equipment

ITEM	VALUE
Machine Tool Manufacturer	HOFLER (40 units)
Grinding Wheel	3M
Process	Form Grinding
Part Type	Wind Power Gear
DIMENSION OF PARTS	Φ20-1250MM