

In-process Measurement of Wear of Grinding Wheel by Using Hydrodynamic Pressure

Background and problem

- Monitoring of grinding wheel wear for precision grinding
- Disturbance of light by working fluid

Solution

- Gap sensing by using hydrodynamic pressure with pressure sensor arranged with small gap

Advantages

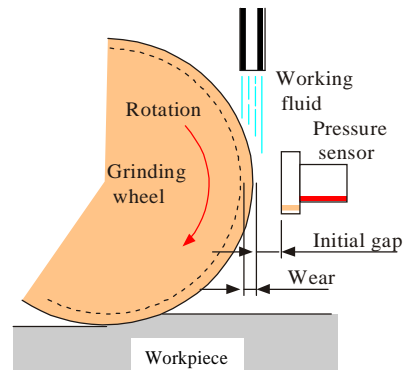
- Simple sensing device
- In-process measurement of radius and topography of grinding wheel
- Dependence of only geometry of grinding wheel

Results

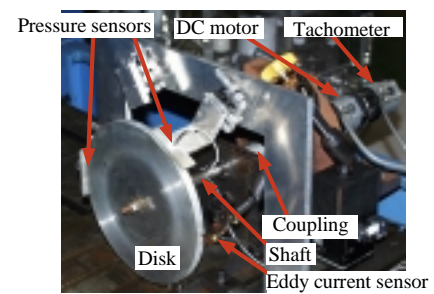
- Relationship among pressure, gap and speed
- Enable to run-out by arranging several sensors
- Standard deviation of 1 μm in measured radii
- Enable to detect loading, shedding and dulling

Applicable field

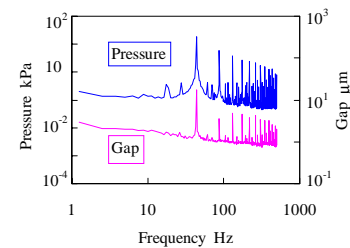
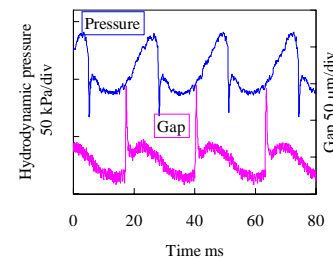
- Plunge grinding
- Creep-feed grinding
- High precision grinding such as ELID
- Grinding expensive material
- Small-amount products



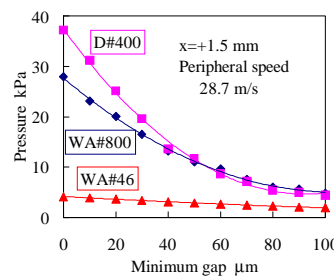
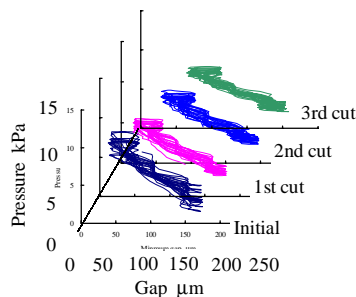
Principle of measurement by using hydrodynamic pressure



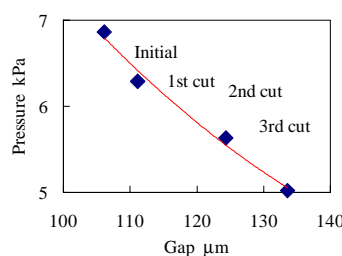
Experimental apparatus



Examples of outputs of sensors

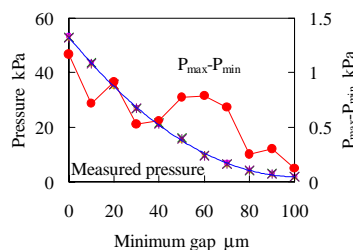


Trajectory of pressure to gap

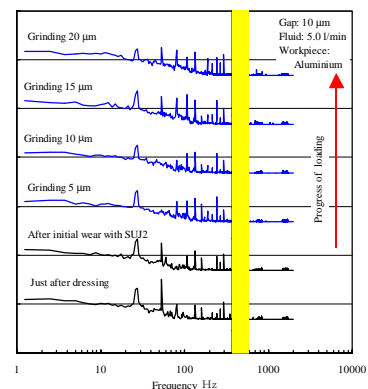


Average pressure vs. gap

Influence of grain size



Dispersion of measured pressure



Detection of loading of grinding wheel