Mass Production of RDDS

We almost established the medium-scale production such as RDDS1.

1. RDDS2

We will use the RDDS1 production technologies for 3~5 structures/year.

2. Studies of Production Technologies

3. Study of Mass Production

We don't have a sophisticated discussions in KEK

• An idea of Diamond Turning Lath
2, 3~5 Structures/Year Production Technologies

Necessary to realize the following items

Technologies

1) Further analysis of machining errors as the of the production system.

2) Reduction of the process time for high precision machining.

3) Disk auto-loading system.
   (Centering)

4) On machine measurement of relevant dimensions.

5) Long tool life.

6) Tool wear diagnostics.

7) Explore better technology than pre-bonding.

8) Better cleaning way for diffusion bonding and reduction dark current.

* First priority
Basic Studies Items

1) Diamond Tool design
   (Prof. Shimada, OSAKA University)

2) Evaporation of Copper atoms
   at high-temperature in Vacuum
   (Prof. Ohashi, Niigata University)

3) Relationship between grain growth
   (grain step) and damage layer by diamond 
   cutting depth

4) Annealed temperature
   Relationship between grain growth
   and annealed temperature before
   final cutting.
Disk auto-loading and centering system

Auto-loading

Centering

\[ \pm 10 \mu m \]

\[ \pm 0.2 \mu m \]
2. Reduction of the process time for high-precision Machining

Eliminate → Intermediary
Diamond cutting

1) 40 mm/min 100 sec 20-40 μm
2) 20 mm/min 206 sec 2 mm

Total ≈ 5 min

RDDS1 ≈ 40 min
Explore better technology than pre-bonding

Purpose of pre-bonding

(Prevent disk-disk slip at the diffusion bonding)

Need

Necessary

Big furnace
Long time period

1) Tig welding

2) Laser welding

3) Do not use pre-bonding

Good contact disk-disk ➞ > 600 kgf
Pressure
Tool Wear of Artificial Diamond for Milling

Tool wear

Metal Tool $\rightarrow$ Artificial Diamond

- Tool wear
- Roughness

[Diagram showing a tool with parameters: 13200 rpm, feed speed 100 mm/min, and 2.5% tool wear.]
表面粗さ測定

![グラフ]

Roughness

送り量（μm） Cutting Speed (unitless units)

切削速度

- 50 m/min
- 70 m/min
- 100 m/min
- 120 m/min
- 150 m/min
切削距離と表面粗さ

切削条件
工具径 φ42mm
切り込み量: 10μ
切削速度: 100m/min (33200rpm)
送り量: 1.6μ/刃 (22mm/min)

パラメーター
切削距離: Pass length (mm)
100 m/min, Pass length 21 Km

150 m/min, Pass length 21 Km
Transfer to Machine Made

What machining errors come from?

We have to investigate

mass production