

## **Slot Die Material Innovations: Tungsten Carbide**

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There are several coating methods in coating science and technology. Especially about accurate coating, Slot Die is well known excellent method. In many cases, whole parts of Slot Die are made by stainless steel. However, there are several problems on Slot Die made by stainless steel.

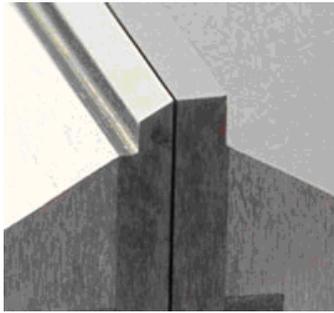
MMC Group developed Slot Die with Tungsten Carbide lips, to solve such several problems.

Well known problems are as follows.

- Tipping problem on the edge of lip.
- Wear problem on the edge of lip.
- Intermittent coat problem for the stop edge and the start edge.
- The sharpness problem of stripe coat.
- Warpage problem of the lip.

Slot Die with Tungsten Carbide lips solves problems mentioned above.

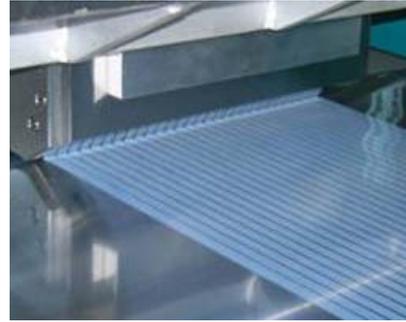
- MMC Group use the sub micron grain of Tungsten Carbide which is produced by own unique technology. It has excellent wear resistance due to high hardness and high compressive strength. This material is widely used for slitting knives and wear-resistance tools.
- Tungsten Carbide is one of very hard metals. Therefore, if there are some collision things in the coating process, there are not any damages on tungsten lip. Tungsten Carbide is excellent wear resistance metal. Therefore the edge of lip maintain the sharp corner shape long time.
- Tungsten Carbide can be shaped very sharp. Therefore we can make sharp edge like a knife on the lip.



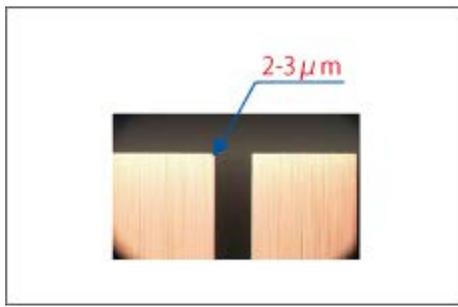
Standard lip.



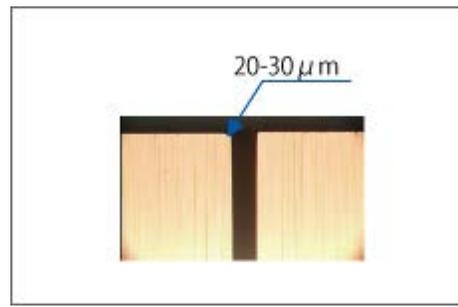
Stripe lip



Stripe coating.

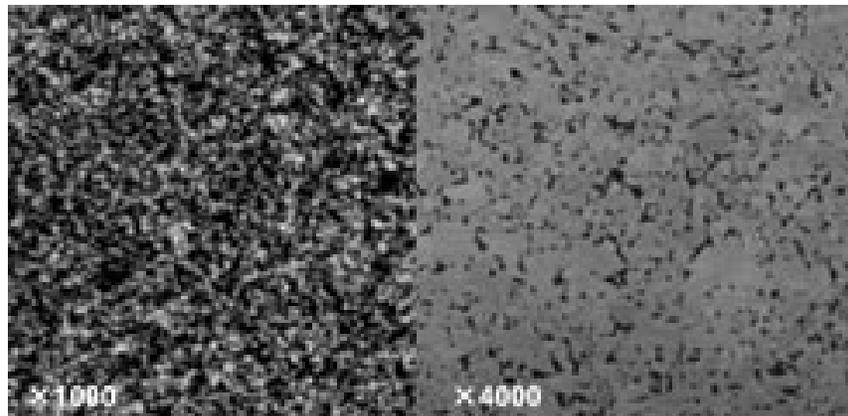


The lip edge of Tungsten Carbide.



The lip edge of Stainless steel.

- This sharp edge like a knife can make the clear intermittent coating edge and the sharp strip coating figure. Our Tungsten Carbide is produced by submicron grain.



- MMC GROUP use special grinding tools to shape the lip of Tungsten Carbide. Therefore the surface of

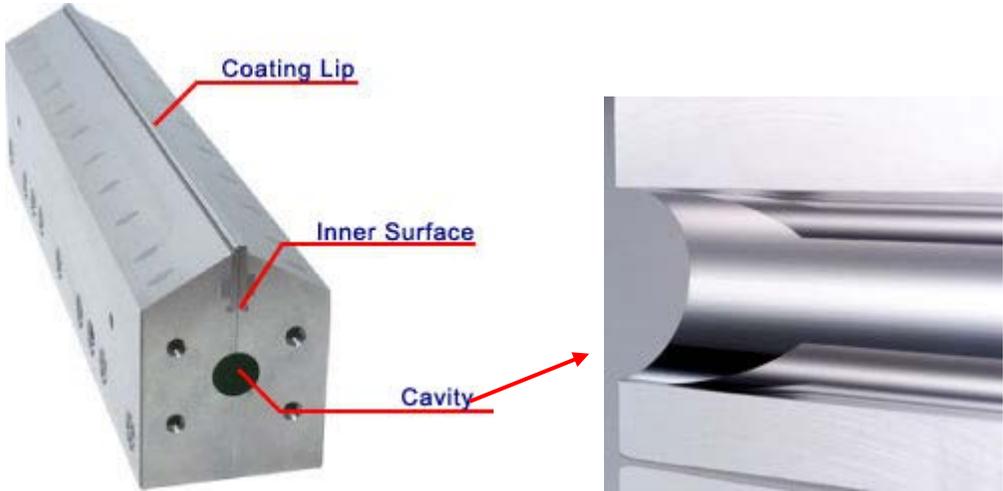
the lip is very flat. It becomes like a mirror. MMC GROUP maintains warpage within 2 micron per meter.

Surface Roughness is below Rz0.2micron



<b>Tungsten Carbide</b>	<b>Stainless Steel</b>
Below Rz0.1 $\mu$ m	Below Rz0.2 $\mu$ m

Actually Tungsten Carbide is used for many cutting tools. For example, Turning, Milling, Drilling, End Mills and Grade. Refer to <http://www.mitsubishicarbide.com/>



MMC GROUP Slot Die can be adjusted the slit width by two methods.

### SLIT-WIDTH ADJUSTMENT SYSTEM

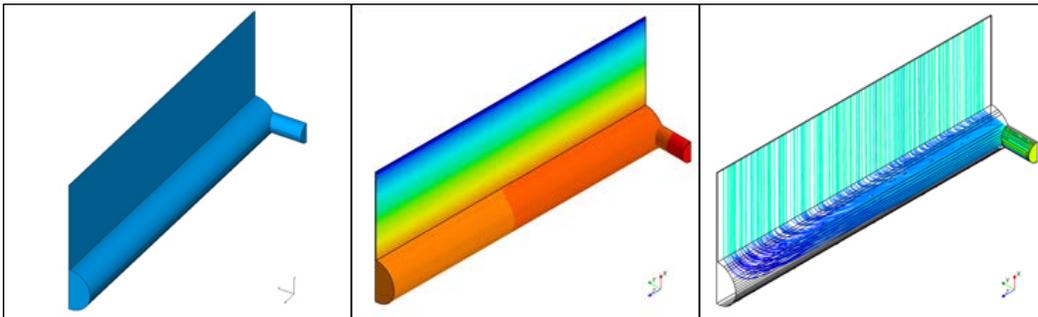


Screw bolts manually.

Cylinder press by oil pressure.

MMC GROUP has capability of the fluid analysis. This fluid analysis is useful to decide the coating process recipe and DOE.

### FLUID ANALYSIS



Model of fluid analysis.

Simulation of inner pressure.

Simulation of flow of liquid

MMC GROUP has several anti-chemical Slot Dies.

MMC GROUP is subsidiary of Mitsubishi Materials Corporation (MMC).

MMC provides many cutting tools of Tungsten Carbide to worldwide. MMC GROUP provides special tools except of MMC products.