

**Award: GOLD MEDAL**

**Category: C (Machine, Equipment & Manufacturing Process)**

## PORTABLE MQL APPLICATOR FOR METAL CUTTING INDUSTRY

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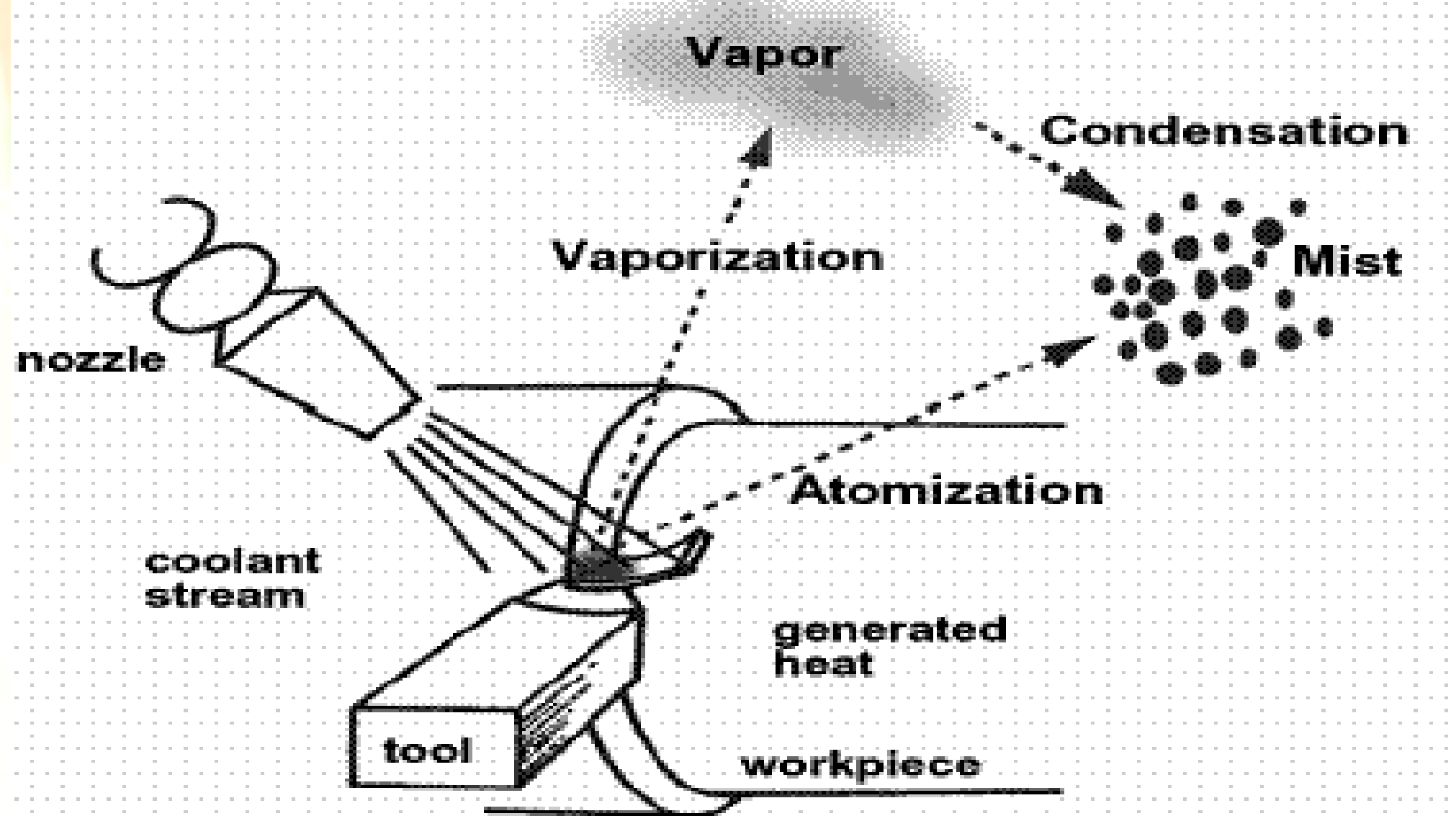
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### Product Description

Machining is a metal shaping process. During machining, cutting tool wears rapidly due to high cutting temperature at the cutting zone. Application of cutting fluids into the cutting zone manages to reduce the heat generated during machining process.

However, cutting fluids are potentially hazardous and there are concerns on their disposal. One alternative to reduce the amount of cutting fluids in the machining process is Minimum Quantity Lubrication (MQL).

MQL is to deliver the small amount of lubricant in mist form into the cutting zone. This project develops simple MQL Applicator for the metal cutting industry. The application of MQL Applicator has shown better results in some processes.



### Problem & Causes

1. The disadvantages of fluids such as environment and health problems.
2. Need the miscellaneous maintenance such as fluids usage, machine condition and manpower.

### Originality & Novelty

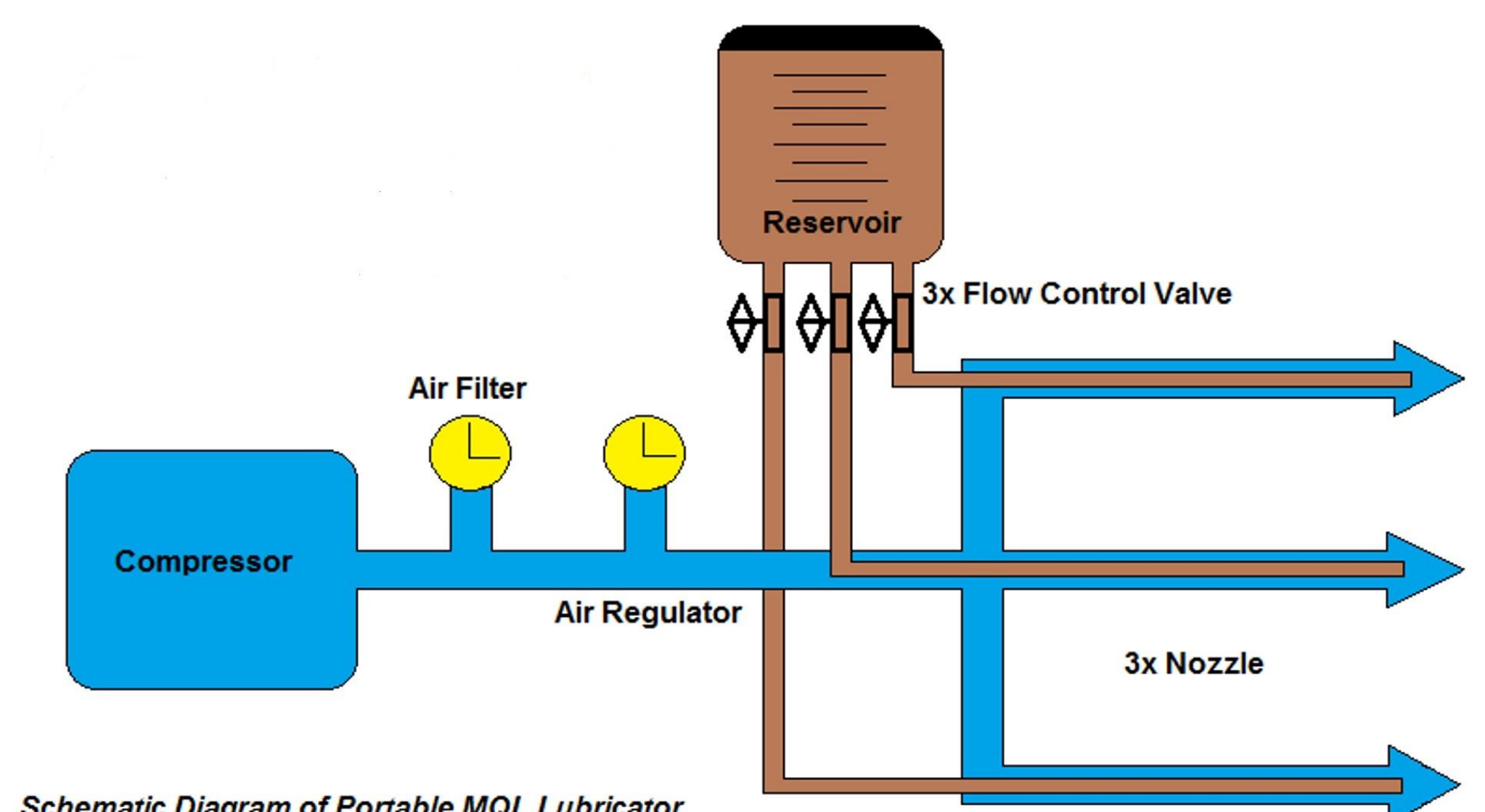
1. Portable – minimum space and easy to install to the machine body with latest design (user friendly).
2. Mobility – easy to carry or to move to any other machines anytime, anywhere.

### Eco - Friendly Aspect

1. Minimise cutting fluid usage and deliver cutting fluid in a flexible and repeatable manner into the cutting tool and workpiece interface during machining process.
2. Avoid the pollution to the whole environment.

### Application & Market Potential

1. Provide enhanced machining performance over flood application.
2. Reduce the fluids costing.
3. Reduce the disposal costing.



Schematic Diagram of Portable MQL Lubricator



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## Results

### Comparison of Tool Wear between MQL and DRY

➤ Tool wear after turning with  $V = 150$  m/min.



**DRY**  
 $f = 0.10$  mm/rev  
 $doc = 0.5$  mm

**MQL**  
 $f = 0.10$  mm/rev  
 $doc = 0.5$  mm

**DRY**  
 $f = 0.15$  mm/rev  
 $doc = 0.5$  mm

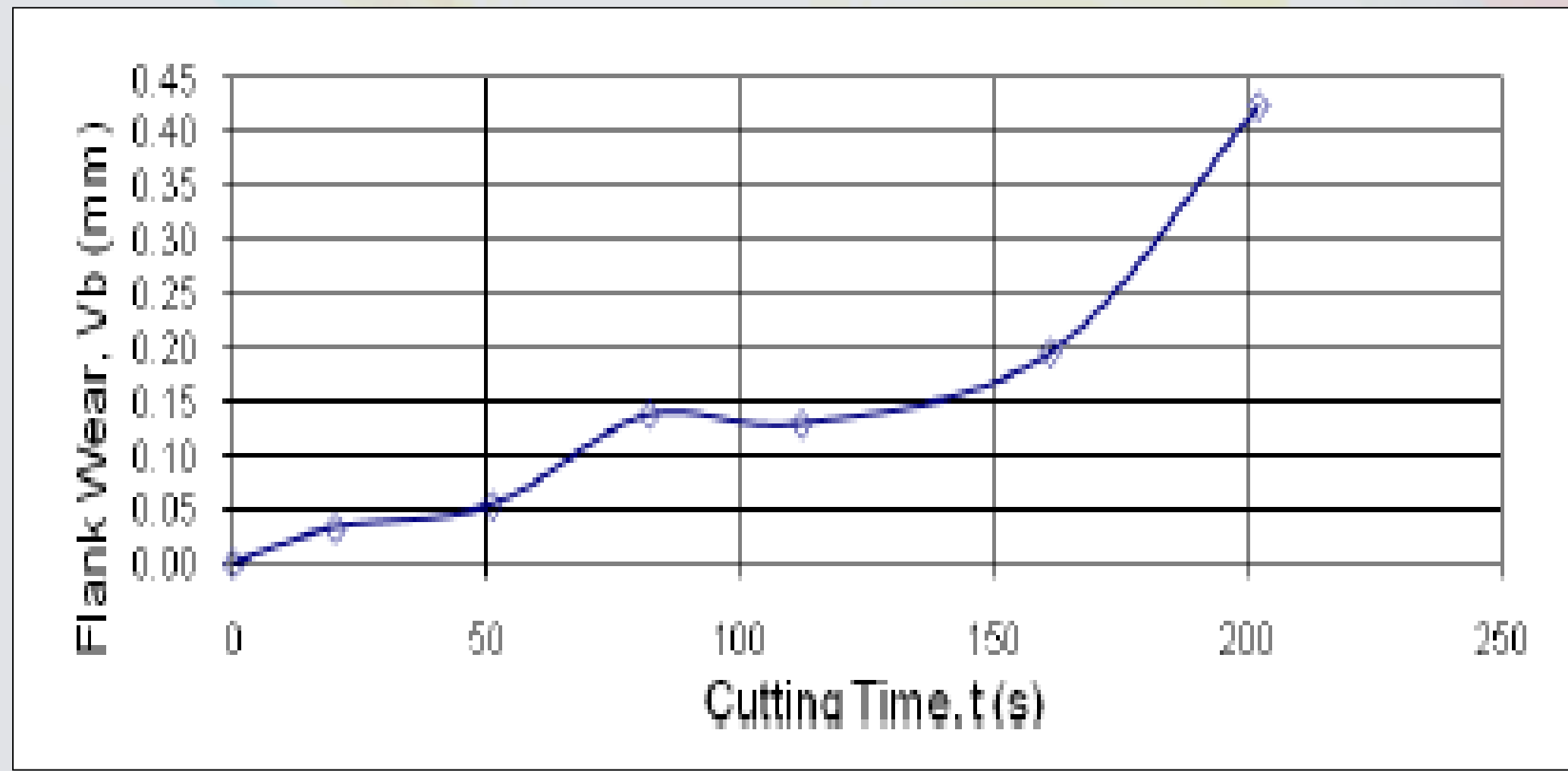
**MQL**  
 $f = 0.15$  mm/rev  
 $doc = 0.5$  mm

**Legend**  
 $f$  = feed rate  
 $doc$  = depth of cut

### Comparison of Tool Life between MQL and DRY

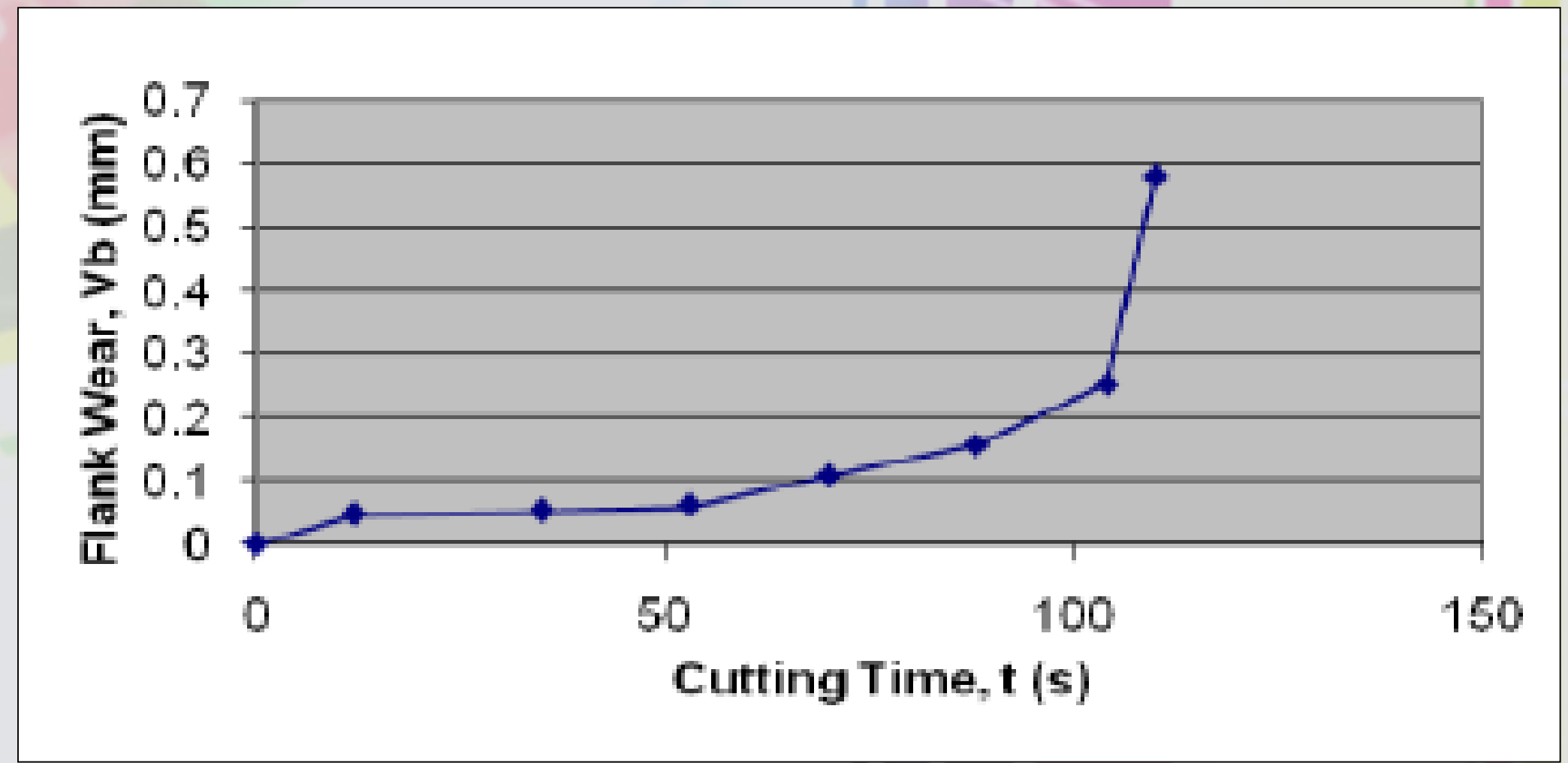
➤ Tool life increase when use low cutting speed.

**MQL**



Flank Wear Vs Cutting Time  
 $V=150$  m/min,  $f=0.15$  mm/rev,  $doc=0.5$  mm

**DRY**



Flank Wear Vs Cutting Time  
 $V=150$  m/min,  $f=0.15$  mm/rev,  $doc=0.5$  mm