

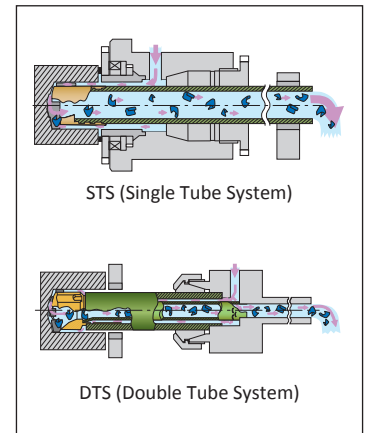
# Cutting Fluid Management

Successful deep hole drilling can be achieved not only by tooling but also by an optimized combination of the tool, the machine and the cutting fluid. The cutting fluid is one of the essential components to obtain safe, stable and cost efficient deep hole drilling. Therefore it is very important to choose and use the cutting fluid correctly.

## Cutting Fluid

The cutting fluid plays a large role in lubrication of tool, cooling of cutting edges and chips, and evacuation of chips in deep hole drilling. It also contributes to improved tool life, surface finish and cutting accuracy when being fed continuously during cutting.

<p><b>Lubrication</b></p>	<p>Lubrication of cutting edges and guide pads is necessary in deep hole drilling. To get the efficient lubrication, it is recommended to use EP (Extreme Pressure) additives which contain <u>sulfur</u> or <u>chlorine</u>.</p>
<p><b>Heat Dissipation</b></p>	<p>The coolability of cutting fluid depends on thermal characteristics such as thermal conductivity and specific heat. The cutting fluid of good coolability increases tool life, but water-soluble type is not preferred in deep hole drilling because of less lubrication effect. If water-soluble fluid is used, the concentration is recommended to be 10% (dilution rate 1/10) or more. <u>Cooling of chips</u> is important as well as cooling of <u>cutting edges and guide pads</u> in deep hole drilling. Temperature control is also important to keep long tool life, stable cutting conditions and cutting accuracy.</p>
<p><b>Chip Evacuation</b></p>	<p>Cutting fluid has an important role in deep hole drilling as it evacuates chips through to the back end of boring bar (for STS) or inner tube (for DTS), whereas it finishes its role as soon as the chips are separated from the workpiece in general cutting. It is also important to control the <u>flow</u> and the <u>pressure</u> of cutting fluid.</p>



## Coolant Unit

Coolant unit is also important to obtain the optimal effect of cutting fluid which has an important role in deep hole drilling.

<p><b>Supply Cutting Fluid Continuously At Constant Pressure And Flow</b></p>	<p>Fluid pressure and flow are recommended to be continuously variable and monitored with a pressure gauge and a flow gauge. Recently, screw pumps with an inverter are suitable.</p>
<p><b>Maintain Constant Temperature</b></p>	<p>The cutting fluid is heated by the factors such as:</p> <ul style="list-style-type: none"> <li>● Cutting edge</li> <li>● Friction of guide pad</li> <li>● Contact duration of heated chips and cutting fluid</li> <li>● Pump</li> </ul> <p>Maintaining of the constant cutting fluid temperature is important to keep stable cutting conditions, chip formation and cutting accuracy. The temperature should be lower than 40 °C for EP additives to provide sufficient lubrication. Therefore the cutting fluid temperature should be kept <u>30-40 °C</u> throughout the cutting operation.</p>
<p><b>Filtration</b></p>	<p>A lot of particles are contained in cutting fluid after finishing cutting and chip evacuation, thus filtration is necessary to remove them. The filter size should be selected to catch particles but not EP additives. The size depends on the cutting fluid, but generally it is suggested to be around <u>10-20 μm</u>. For iron-based workpieces, magnetic separator will be helpful which decreases filter maintenance frequency.</p>

