Vis_cal

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1 介绍

Vis_cal用于计算润滑油的粘度系数和温度，参考于ISO 6336-22[1]

2 原理

2.1 运动粘度

The kinematic viscosity at bulk temperature, $\nu_{\theta M}$, can be calculated from the kinematic viscosity at 40 $^{\circ}C$, ν_{40}, and the kinematic viscosity at 100 $^{\circ}C$, ν_{100}. Extrapolation for temperature higher than $140^{\circ}C$ should be confirmed by measurement.

$$log[log(\nu_{\theta M}+0.7)] = A \cdot log(\theta_M + 273) + B \tag{1}$$

where

$$A = \frac{log[log(\nu_{40}+0.7)/log(\nu_{100}+0.7)]}{log(313/373)} \tag{2}$$

$$B = log[log(\nu_{40}+0.7)] - A \cdot log(313) \tag{3}$$

where

θ_M is the bulk temperature.

ν_{40} is the kinematic viscosity of the lubricant at $40^{\circ}C$

2.2 密度

If the density of the lubricant at bulk temperature, $\rho_{\theta M}$, is not available, it can be approximated based on the density of the lubricant at 15 $^{\circ}C$ according to

$$\rho_{\theta M} = \rho_{15} \cdot [1 - \frac{(\theta_M + 273) - 288}{15\rho_{15}}] \tag{4}$$

where

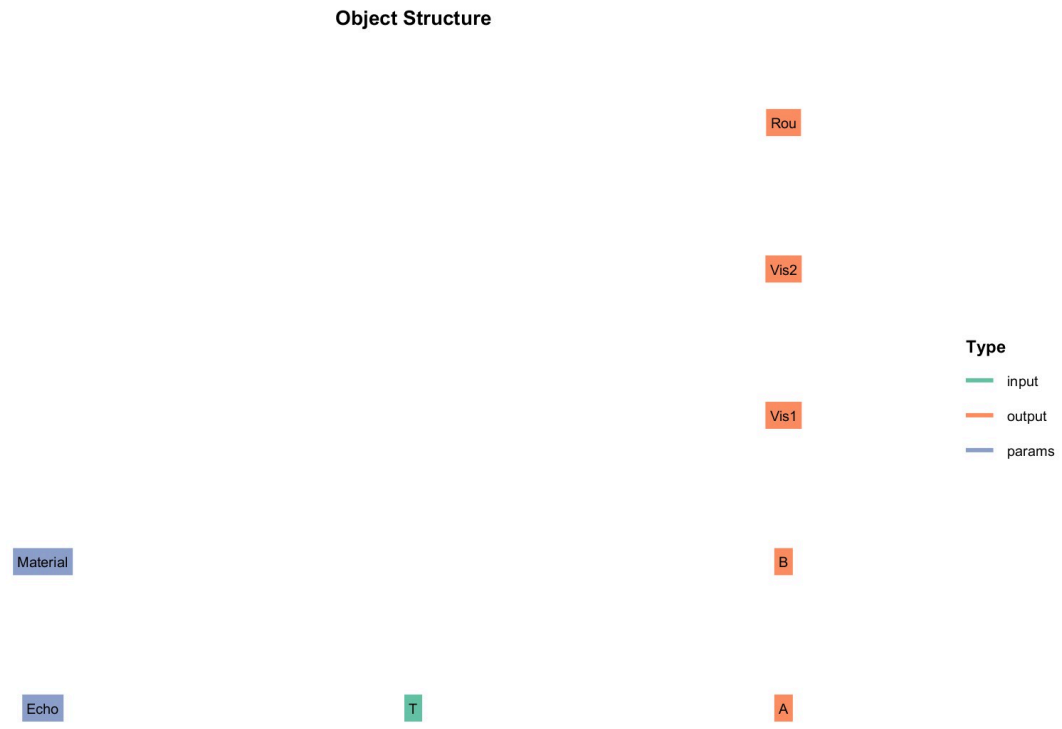
ρ_{15} is the density of the lubricant at 15 $^{\circ}C$ according to the lubricant data sheet

θ_M is the bulk temperature

If no data for ρ_{15} is available, then below formula can be used for approximation of mineral oils

$$\rho_{15} = 43.37log\nu_{40} + 805.5 \tag{5}$$

3 类结构



输入 input：

- T : 温度

参数 params:

- Material： 润滑油的材料属性

输出 output :

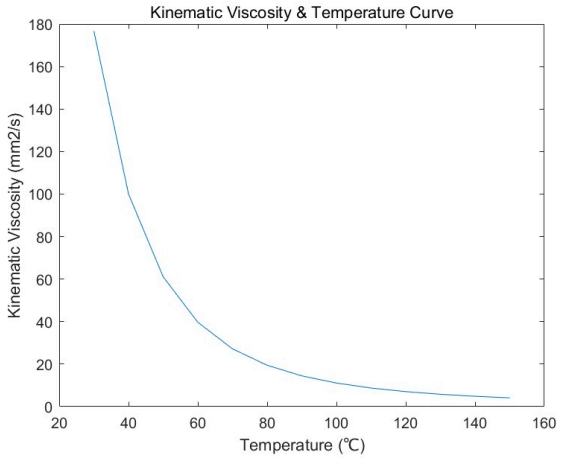
- Rou : 润滑油在该温度下的密度
- Vis1 : 该温度下运动粘度系数
- Vis2 : 该温度下动力粘度系数
- B : 参数B
- A : 参数A

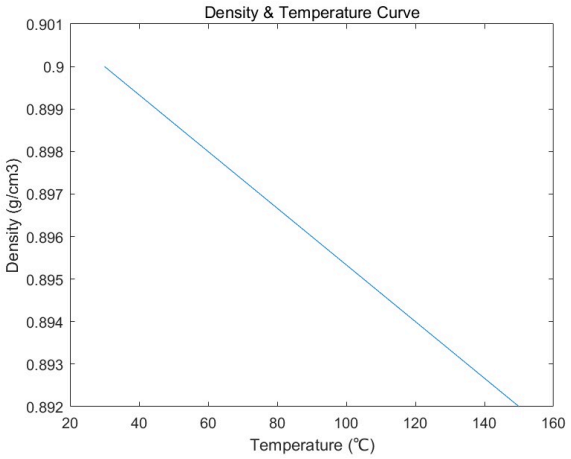
4 案例

以ISO-VG 100为例，计算70℃时的运动粘度系数。

```
%% Caculate the vis
S=RMaterial('Lubricant');
Mat=GetMat(S,3);
inputStruct1.T=70;
paramsStruct1.Material=Mat{1,1};
Vis=method.Vis_cal(paramsStruct1, inputStruct1);
Vis=Vis.solve();
%% Plot vis, rou&Tempearture curve
x=(30:10:150)';
```

```
y1=NaN(numel(x),1);
y2=NaN(numel(x),1);
for i=1:numel(x)
    Vis.input.T=x(i);
    Vis=Vis.solve();
    y1(i)=Vis.output.Vis1;
    y2(i)=Vis.output.Rou;
end
figure
plot(x,y1)
title('Kinematic Viscosity & Temperature Curve')
xlabel('Temperature (℃)')
ylabel('Kinematic Viscosity (mm2/s)')
figure
plot(x,y2)
title('Density & Temperature Curve')
xlabel('Temperature (℃)')
ylabel('Density (g/cm3)')
```





5 参考文献

[1] ISO\TR 6336-22