[Technical Calculations] Designing of Chain Drive Mechanism 2

**Selection of Stainless Roller Chains (CHES)**
Selection of stainless roller chains follows the specification selection for low-speed operation.
1. The maximum allowable tolerance for CHES (stainless type) is lower than that for CHES (steel type).
2. Avoid using offset links as much as possible.

**Impact Coefficient**
This is a constant, shown in (Table 5), determined by the ratio of inertia(16) of prime mover to driving machine as well as the magnitude of play in the power transmission mechanism used.
When the power transmission mechanism has excessive play, it loads greater impact than those in the table can result.

**Specification Selection for Low-Speed Operation**
In operations using a chain speed of 50 m/min. or less, chain elongation due to wear can almost be ignored. Under such low-speed conditions, the service life of the chain largely depends on the low-speed operation. In operations with frequent startups and stops that enable smooth power transmission. Selection of ambient atmosphere, layout, lubrication, etc. for low-speed operation is the same as that for operation under normal conditions. Selection should be made in accordance with the following formula.

1. **Operating Conditions**
   - Same as for "Specifications Selection for Operation under Normal Conditions".

2. **Chain and Number of Sprocket Teeth**
   - From the selection guide table (Table 2815), select a chain and a sprocket slightly undersized for the rotary speeds(m/min) and the prime mover(kW) used.

3. **Calculating the Chain Speed**
   - Based on the sprocket selected/main pitch, number of teeth and the ratio of revolution(16)/min, calculate the chain speed as follows.
   - V: Chain Speeds/min
   - \( V = \frac{P \times n}{1000} \) (m/min)
   - P: Chain Pitch(mm)
   - n: Number of Sprocket Teeth
   - V: Number of Sprocket Teeth (min)

4. **Calculating the Maximum Working Load on Chain**
   - The maximum working load on the chain is calculated using the following formula.
   - F: Load on Chain(kN)
   - V: Chain Speeds/min
   - kW: Power Transmission

5. **Application Coefficient**
   - From the application coefficient table (Table 1), select the appropriate coefficient.

6. **Speed Coefficient**
   - Based on the chain speed obtained in (1), calculate the appropriate speed coefficient.

7. **Maximum Allowable Tension of Chain**
   - In the formula, substitute the values obtained in (1),(2),(3) as well as the maximum allowable tension(P2141-P2152) for the chain selected in (2). Check whether these values satisfy the formulas. If not, try again with another chain and sprocket.

8. **Number of Large Sprocket Teeth, Shaft Diameter, and Chain Length**
   - As for "Specification Selection for Operation under Normal Conditions".

**Selection based on temperature**
Selection of Roller Chains Based on Temperature
The following table shows selection criteria for roller chains by size based on temperature and the associated reduction in strength.

1. Problems associated with roller chain operation at high temperature (16) hardened hardness and resultant increase in decrease due to softening

2. Problems associated with roller chain operation at low temperature and the associated reduction in impact strength

3. Selection of Stainless Roller Chains for High-Temperature Operation
   - (Table 2815), use the temperature coefficient described below.

   \( \Phi = \text{Temperature Coefficient} \)

- Take account of corrosion resistance, which begins to decline above 400°C.

**Power and Torque**
1kW=102kgf·m=1PS=735.5W(Metric Power)
1kW=1000W

**Output (kW)=**

- \( \text{Torque}\) x \( \text{Rotary speed}\) / 60

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**Table 4. Speed Coefficients**

<table>
<thead>
<tr>
<th>Roller Chain Speed</th>
<th>Speed Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 m/min</td>
<td>1.2</td>
</tr>
<tr>
<td>150 m/min</td>
<td>1.4</td>
</tr>
<tr>
<td>200 m/min</td>
<td>1.6</td>
</tr>
</tbody>
</table>

**Table 5. Impact Coefficient**

<table>
<thead>
<tr>
<th>Temperature</th>
<th>CHES65 or Less</th>
<th>CHES65 or Above</th>
</tr>
</thead>
<tbody>
<tr>
<td>60°C or Below</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>80°C to 100°C</td>
<td>Cannot Be Used</td>
<td>Catalog Value</td>
</tr>
<tr>
<td>120°C to 160°C</td>
<td>Catalog Value</td>
<td>Catalog Value</td>
</tr>
<tr>
<td>160°C to 200°C</td>
<td>Catalog Value</td>
<td>Catalog Value</td>
</tr>
<tr>
<td>Above 200°C</td>
<td>Cannot Be Used</td>
<td></td>
</tr>
</tbody>
</table>

**Selection of Stainless Roller Chains for High-Temperature Operation**

- The specifications selection for low-speed operation up to 400°C is used in the specification selection method for operation under normal conditions.

- Above 400°C, use the temperature coefficient described below.

- **Formula**

- **Temperature Coefficient (K)K**

- **Take account of corrosion resistance, which begins to decline above 400°C.**