A question that is quite frequently asked is how a chain drive is selected. This paper details the inputs required and methods that can be used to select a chain drive.

There are two methods that can be used to select a chain drive.

1. Easy selection method
2. Using horsepower (HP) rating tables

The easy selection method will be discussed here.

Inputs that are required to start designing a chain drive are as follows:

1. HP
2. Driver and driven speeds (RPM) and shaft sizes
3. The surrounding conditions

**Easy selection method:** Follow these steps while using this method.

1. Determine class of service
   - **Class A:** Fairly-uniform load
   - **Class B:** Variable running load
   - **Class C:** Heavy starting loads

2. Select the service factor (SF) using **Table 1.**

<table>
<thead>
<tr>
<th>Class of Service</th>
<th>Internal Combustion Engine with Hydraulic Drive</th>
<th>Electric or Turbine</th>
<th>Internal Combustion Engine with Mechanical Drive</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1.0</td>
<td>1.0</td>
<td>1.2</td>
</tr>
<tr>
<td>B</td>
<td>1.2</td>
<td>1.3</td>
<td>1.4</td>
</tr>
<tr>
<td>C</td>
<td>1.4</td>
<td>1.5</td>
<td>1.7</td>
</tr>
</tbody>
</table>

**Table 1.** Type of input power.
Table 2. Class of Service for Driven Machine

3. Calculate the design HP (DHP): Driver HP X SF or normal running HP X SF.

4. Determine chain size and smaller sprocket (normally driver) number of teeth. Refer to Table 3.
### Table 3. Selection table

**Note:**
1. Apply Service Factor to obtain Design Horsepower. Select small sprocket based upon Design Horsepower and RPM on this chart.
2. Sprocket selections are recommended minimum. Larger sizes may be selected if required to obtain desired ratio, etc.
3. To use this chart for double or triple strand chain, divide the design horsepower by the following factors:
   - Double strand: 1.9
   - Triple strand: 2.9
Table 4. Selection table

Start at the column that is equal to or above the calculated DHP and trace down to the row that includes the faster shaft (normally driver). The chain pitch and sprocket number of teeth are listed at the intersection. Please refer to Table 3.

5. Calculate drive ratio: Faster shaft RPM divided by slower shaft RPM.
6. Calculate the size of the larger sprocket: Multiply the smaller sprocket number of teeth by the calculated ratio. Select the sprocket which is closest to this and has a stock part number.

7. Calculate the chain length (L):

\[ L = 2c + 1.57(D + d) + \frac{(D-d)^2}{4c} \]

Where:  
- \( D \) = Pitch dia. large sprocket,  
- \( d \) = Pitch dia. small sprocket,  
- \( c \) = Proposed center distance

8. Divide chain length (inches) by chain pitch to determine number of pitches in the chain. It is best to use an even number of pitches.

Here is a selection example.

HP: 5, electric motor on a gear box  
Driver RPM: 77  
Driven RPM: 24  
Center distance: 50 in.  
Application: Tumbling barrel (heavy starting loads, peak loads & frequent shock loads)

The class of services table (Table 2) does not list this application, but looking at application above, it is class C. Therefore, SF should be 1.5 from Table 2.

DHP: 5 X 1.5=7.5

Chain and smaller sprocket: Referring to Table 3, look at the column for 7.5HP. Go down to the RPM of 71-80 for smaller sprocket. This shows a chain size of 100 with 15 teeth.

Drive ratio: 77/24=3.21:1

Larger sprocket: This sprocket should have 15 X 3.21 = 48.15 teeth. Since we cannot have 48.15 teeth, select a sprocket with 48 teeth (100 chain).

Chain length: This is calculated based on equation as given in 7 above.

\[ L = 2 \cdot 50 + 1.57(19.113 + 6.013) + \frac{(19.113 - 6.013)^2}{4 \cdot 50} \]

\[ L=140.31 \text{ (No. 100 chain has 1.25 pitch), therefore length in pitches is } L=140.31/1.25=112.48 \text{ pitches. Choose 112 or 114 pitches.} \]

Verify that the sprockets fit the shaft sizes.

For any questions on mechanical drives, or any other mechanical power transmission products, please call us at 864-284-5700 or e-mail us at DodgeEngineering@abb.com.