# SE Encore Worm Gear Speed Reducer Selection Criteria

When choosing an SE Encore speed reducer, a number of application issues require consideration. This section of the catalog assists with the selection of the optimal SE Encore worm gear speed reducer for an application. Proper reducer selection ensures desired operating results and long product life. The Selection Guide on page 219 employs a series of questions as a guide for this process. Each question includes referenced catalog pages that contain more detailed information.

## Service Life and Catalog Ratings

Worm gear speed reducer ratings are based on a nominal service life when operated at the published levels. Nominal service life is defined by AGMA as 25,000 hours when the appropriate reducer service factor is selected, proper lubrication employed at installation, and appropriate maintenance practices are followed. If an application requires a nominal service life greater than 25,000 hours, a higher service factor should be used in the selection process. Contact Winsmith regarding the application and gearing configuration before employing service factors lower than 1.00 (a nominal service life of less than 25,000 hours). Intermittent duty applications with a high number of starts and stops can have a dramatic negative impact on the life of a worm gear speed reducer. Reference the Winsmith Motion Control Products catalog for additional information on the selection of intermittent duty reducers (available at www.WINSMITH.com).

## Service Life

The nominal service life defined by AGMA is not a guarantee of the actual service life of any specific gear reducer, but is an average calculated life derived from industry formulas and other factors such as test results, proprietary calculations, and assumptions. These factors take into consideration the metal composition, the design of the gearing and bearings, as well as calculated loads. Service life calculations are not based on actual field conditions or applications, and do not represent a guarantee with respect to expected life, performance, or other characteristics of a gear reducer in any given application or use. The actual service life could vary substantially from the nominal service life.

Service life calculations apply only to the gearing and bearings. There are no service life calculations for other gear reducer components such as structural parts, seals, and lubricants.

Seals and lubricants are maintenance items; replacement cycles will vary with operating conditions. Regular inspections, followed by appropriate maintenance, are recommended.

## Factors Affecting Service Life

In any given application, numerous factors can affect the service life of a speed reducer. Some of these include: overhung and thrust loads, environmental conditions, intermittent duty, and sealed vs. vented operation. These factors are discussed in further detail in this Appendix.

This appendix contains important information regarding Winsmith products, including selection, application, operation, and service factor information. Please review it and other available guidance carefully before selecting or recommending a gear reducer for any application.

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## Speed Reducer Selection Methods

There are two primary methods of choosing an SE Encore worm gear speed reducer when knowing the specific load requirements. When using either method, the first step is determining the application service factor using the tables on pages 233-235. Then, using the selection guides throughout this section, choose either of the following methods:

- **Selection Method #1:**
  When the required output torque and the speed reduction between the input and output shaft speeds are known, the proper speed reducer can be selected using the appropriate ratio, service factor, and output torque information found in the ratings section.
- **Selection Method #2:**
  When the available input horsepower and the speed reduction between the input and output shaft speeds are known, the proper speed reducer can be selected using the appropriate ratio, service factor, and output torque information found in the ratings section. Note that the speed reducer may be incorrectly sized (undersized or oversized) if the available input horsepower (motor) is used as the primary method for selection.

## Selection Method #1: Speed Reducer Selection Procedure using Output Torque

When using the output torque for speed reducer selection, the applied output torque (output torque, lbf-in) and output speed (rpm) are requisites. The output torque is determined by the application requirements. The steps that follow help complete the selection of the optimal speed reducer:

1. Determine the service factor (S.F.) from the table on page 236 for the desired application and daily operating service duration.
2. Determine the design output torque (design output torque = applied output torque x S.F.).
3. Determine the speed reducer gear ratio or output speed (output rpm) required from the application (see page 218 for available standard ratios).

## Selection Method #2: Speed Reducer Selection Procedure using Input Horsepower

When using the input horsepower for speed reducer selection, the applied input horsepower (input HP) and input speed (input rpm) are requisites. The input speed is typically constant and generated from an AC or DC motor. The steps that follow help complete the selection of the optimal speed reducer:

1. Determine the service factor (S.F.) from the table on page 236 for the desired application and daily operating service duration.
2. Determine the design input horsepower.
   The design input horsepower = applied input horsepower x S.F.
3. Determine the speed reducer gear ratio or output speed (output rpm) required for the application (see page 218 for available standard ratios).

## Overhung and Thrust Load Requirements

These loads are in addition to the transmitted torque and are applied either to the input or to the output shaft of a speed reducer. Most often, the driven equipment handles these loads. However, in a relatively small number of applications, they are great enough that the strength of the reducer components becomes a factor in speed reducer selection. If excess overhung or thrust loads are transmitted to the reducer, the service life could experience a significant decrease from the published catalog levels. Please refer to “Overhung Load and Thrust” on page 227 of this section.

## Output Speed and Gear Ratio Requirements

Selecting the correct SE Encore speed reducer ratio is an important initial application criterion because it determines the operating output speed of the speed reducer and sets the parameters for output torque and input horsepower. The gear reduction ratio also affects the selection of the reducer configuration because their performance characteristics vary dependant upon the center distance and configuration of the reducer.

The SE Encore series of worm gear speed reducers are available in three gear reduction combinations, each having a unique range of gear ratios:

1. Single reduction worm,
2. Double reduction worm, and
3. Double reduction helical/worm

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Some of the same gear ratios found in one combination will overlap with those of one or more of the other two combinations and they will each exhibit different performance characteristics (output torque, input horsepower capabilities, efficiencies, etc.). Before finalizing the speed reducer selection, check each overlapping ratio combination for the optimal performance characteristics (see Table on page 218 for a summary of standard ratios).

## Ratio Selection

1. Determine the RPM of the prime mover (i.e. motor) that attaches to the speed reducer.
   - Fixed input speed. The standard operating speed of an AC induction motor (e.g., 1750 RPM for a 4 pole motor).
   - Variable speed motor and control input. Choose the ratio that satisfies the application requirements and speed reducer limitations at the highest motor speed (e.g., for a motor with a variable speed between 583 and 1750 RPM range, use 1750 RPM for ratio selection).
   - Non-motorized input. A combination of belts and sheaves, or similar separate speed control devices can be used as an input to a gear reducer.
2. Determining the output RPM required for the application is independent of the speed reducer selection process. There are a number of useful formulas on page 238, that assist with this determination.
3. SPEED REDUCER RATIO = INPUT RPM / OUTPUT RPM. Based on the previous calculations, select the speed reducer ratio that corresponds to the center distance (size) and configuration (single, double, or helical/worm) from the Table 1. Input horsepower and output torque ratings at 1750 rpm and 1.0 service factor are included as a reference guide.

## Product Configuration

The SE Encore series of worm gear speed reducers offers a wide range of configurations to fit a variety of applications and design requirements. Achieving the most effective overall system performance requires consideration of the speed reducer configuration early in the design phase. Some important speed reducer configuration issues are:

1. Output shafts – solid or hollow
2. Speed reducer mounting – eleven standard types
3. Multiple reductions – worm or helical primary combined with a worm secondary

## Environmental Requirements

Environmental conditions can decrease the service life of a speed reducer because they can cause deterioration of components such as shafts and seals. The WinGuard Epoxy Coating System encloses the entire SE Encore series of worm gear speed reducers offering significant protection from environmental elements.

However, there are some operating environments (i.e. outdoor, wash down, pharmaceutical, etc.) that require higher levels of contamination protection. Winsmith offers a number of worm gear speed reducer enhancements that address these conditions including stainless steel reducers and shafts, special seals, etc. Some of these special features are described in the Modified section of this catalog. For more detail, please visit **www.WINSMITH.com** and review our SE Maximizer Series product line.