



CHAIN - PART 1: History and Roller Chain Terminology

PA NOTE

Chain is commonly used in various applications for power transmission, and as such, involves sales of hundreds of millions of dollars annually. The introduction of the new Poly Chain® urethane/Kevlar [aramid] high performance synchronous belt provides the opportunity for capturing a share of that market. This five-part series of PA Notes is intended to aid penetration of the chain market by better informing you as to the history, properties, advantages and disadvantages of chain. The next four PA Notes will cover Types of Chain, Chain Drive Design, Lubrication and Maintenance, and Advantages and Disadvantages of Chain.

HISTORY

Chain is one of the oldest power transmission and material transport devices known to man. There is evidence of a chain-driven water lift existing as early as 225 B.C. During the sixteenth century, Leonardo da Vinci sketched a number of chain designs, many being similar to modern chain. One of da Vinci's chain sketches bore a strong resemblance to modern silent chain.

By the early 1800's, development of cog chain began to gather momentum. The early designs had frequent breakage problems and were difficult to repair. These problems were addressed in 1873 with the introduction of cast detachable chain. The development of cast detachable chain greatly assisted the growing mechanization of farm machinery in the late 1800's. The cast pintle chain, developed in the late 1800's, was the forerunner of chain as we know it today.

The beginning of the twentieth century saw the expansion of chain into such applications as bicycle and automobile drives. Chain was used on automobiles to transmit power from the transmission to the driving axle, as well as application on camshaft drives. A 1/4 turn chain drive was used for the propeller drives on the Wright Brother's first successful airplane. The roller chain industry was the first industry in the world to publish user standards when they did so in 1913.

COMPONENTS AND TERMINOLOGY

The roller link is an assembly of four components.

1. Pin and roller link plates - primary tension bearing members in the chain.
2. Pin - connects pin link plates. Pin/bushing interface provides chain flexure.
3. Bushing - connects roller link plates. Supports free turning rollers.
4. Roller - free turning. Provides rolling engagement with sprocket teeth.

The pin is usually press-fit into the pin link plate, but can also be held in place using a cotter pin. The bushing is press-fit into the roller link plate. The roller link is a complete assembly composed of the pin and roller link plates, pin, bushing, and roller.



Many variations of single strand roller chain exist. One of the most frequently encountered is multiple strand chain. This is simply a single structure composed of two or more strands.

Standard series roller chain can have up to 6 strands, while heavy series chain is available with up to 8 strands. Multiple strand chain is used to provide increased power capacity without increasing the chain's pitch or linear speed.

Double pitch chain, often referred to as engineering chain, is essentially chain with every other roller missing. The regular pins, bushings, and rollers are used, but the pitch is double that of roller chain of the same size. Double pitch chain is generally used for light duty applications such as conveyor drives.

An offset side bar is used when an odd number of links is required. Offset side bar chain generally provides lighter load and slower speed capability than roller chain. Offset side bar chain is often used on light duty drives such as construction machinery or conveyors in high temperature ovens. The best wear resistance occurs when it is operated with the open end forward.

One of the principal dimensions of chain is the pitch, or distance between centers of adjacent rollers. Chain is identified by its pitch. Single strand chain width and roller diameter are both approximately 5/8 of the pitch. The following examples will aid in recognizing and understanding standard industry designations.

- a. #60-4 The "6" identifies the pitch in 1/8" increments. The 2nd digit is 0 for roller chains of the usual proportions, 1 for a light-weight chain, and 5 for a rollerless bushed chain. The "-4" identifies a multiple strand chain, in this case 4 strands.
- b. #2060 As per (a), except the "20" identifies a double pitch.
- c. #60-SR As per (a), except the "SR" specifies a solid roller(no bushing).
- d. #60H As per (a), except the "H" identifies a heavy series where all link plates are 1/32" thicker than standard link plates on chain of the same pitch.
- e. #LL-60 As per (a), except "LL" identifies Browning "Lubed for life."
- f. #SB-60 "SB" identifies Morse sintered bushing.
- g. #40-DL "DL" identifies Diamond "Duralube".

All three are lubed for life chains.

The second in this series of five PA Notes will discuss the various types of chain.