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Conveyor Chain & Sprocket Corrosion Resistant Chains

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Conveyor Equipment Manufacturers Association
1250 Tamiami Trail N., Suite 211
Naples, Florida 34102
www.cemanet.org

Coresion Resistant Chains

When making chain selections for corrosive environments several factors should be considered. The first factor is to determine if the application is a power transmission application or conveying application.

Coated or plated carbon steel chains (zinc or nickel coatings) and stainless-steel chains are used in corrosive environments.

Power transmission chain application selections are based on horsepower tables or working loads. In the case of carbon steel chain selections, they are based on HP tables or working loads. In the case of stainless-steel chains, the working load is based on bearing pressure between the pin and bushing.the plate.

Conveyor chain selections are based on working loads that are determined by bearing pressure between pin and bushings (Working Load = Bearing Area X Bearing Pressure with Bearing Area defined as length of bushing X pin diameter). In the case of conveyor applications, the limiting factor may not be pin/bushing wear but roller/bushing wear when the chain is tracked by the roller. In those cases, the roller material may need to be altered.

Corrosion resistant chain may be required based on the environmental conditions like chemicals or temperature. Some food-handling applications have special governmental FDA requirements. The standard options available:

Nickel Plated

- Temperature range: 32°F to 350°F, PH range: 7
- Protects the base metal by creating a barrier between the base carbon steel material the environment
- Working loads: Based on carbon steel horsepower tables or fatigue strength of the chain.
- Pros: Cosmetic appearance, and barrier corrosion protection.
- Cons: Chain components are plated before assembly. When components are assembled using press fits into link plate pitch holes, a limited amount of plating is removed, and corrosion can initiate in this area. Coated chains cannot be used in direct contact with food, per FDA restrictions.

Zinc Coated Chains

- Temperature range: 32°F to 350°F
- PH range: Based on additional alloying elements to the zinc like Al or Ni the PH range can be 5PH to 12PH.
- Zinc coatings are generally sacrificial and are a function of the slow dissolution of zinc from the surface. Zinc has the ability to form protective layers depending on the environment. When protective layers have formed the rate of base metal corrosion is greatly reduced.
- Working loads: Based on carbon steel horsepower tables, fatigue strength or bearing pressure of the chain.
- Pros: When other elements are added to the zinc, it provides one of the best corrosion resistant coating for carbon steel chain. The zinc coating is applied to the components before assembly, but since the coating is a sacrificial material the press fits have minimum impact on corrosion in this area.
- Cons: Zinc coated chains should not be used in sulfur dioxide or chlorine environments. The chain appearance is normally grayish color. Coated chains cannot be used in direct contact with food, per FDA restrictions.

Austenitic Stainless Steels

- Typical types of stainless steels are 304SS and 316SS. Other types of stainless steels are available based on environments. Please consult your chain manufacturer for options.
- Temperature ranges:
  - 304SS: - 40°F to 750°F
  - 316SS: - 40°F to 930°F
- Consult your chain manufacturer’s catalogs to determine the appropriate stainless material based on type of chemicals that the chain will be exposed to.

- Working loads for austenitic stainless-steel chains are based on a bearing pressureof 1,420 psi between the pin and bushing. This bearing pressure can be doubled if the chains are effectively lubricated and the chain is totally resistant to chemical.
- Pros:
  - 304SS:
    * General stainless steel
    * Excellent resistance to corrosion
    * Chain is slightly magnetic
  - 316SS:
    * Higher grade of stainless steel
    * Superior corrosion resistance
    * Excellent resistance to: Chlorine, Sulfur
    * Chain is considered nonmagnetic
    * Best chain for extreme temperatures
- Cons:
  - Austenitic stainless steel is non-hardenable with a low hardness. This results in low working loads and reduced wear life.
  - When compared to heat treated carbon steel chains the working loadsof these stainless-steel chains are reduced by the following:
    * Power transmission Precision Roller Chain: Approximately 1/8
    * Conveyor Precision Roller Chains: Approximately 1/6
    * Conveyor Engineered Chains: Approximately 1/3
- Speed limitation is 230 fpm.
- Martensitic Stainless Steel
  - Typical types of stainless steels are 400SS or 600SS. Other types of stainless steels are available based on environments. Please consult your chain manufacturer for options.
    * Precision roller chain: Typically, the round parts are martensitic stainless hardened with austenitic stainless side plates.
    * Engineered class chain: Typically, the round parts are martensitic stainless hardened with non-hardened martensitic side plates.
  - Temperature ranges:
    * 304SS: - 20°F to 500°F
  - Consult your chain manufacturer's catalogs to determine the appropriate stainless material based on type of chemicals that the chain will be exposed to.
  - Working loads for martensitic stainless-steel chains are based on a bearing pressure of 2,130 psi between the pin and bushing. This bearing pressure can be doubled if the chains are effectively lubricated and the chain is highly resistant to chemicals.
- Pros:
    * Martensitic stainless steel is hardenable, which allows for increased hardness and improved wear life.
    * Working load of the chain is 50% higher than all 300SS series chains (based on bearing pressure).
    * Chain has better wear life than all 300SS series chains (higher hardness on pin and bushing).
- Cons:
    * When compared to heat treated carbon steel chains the working loads of these stainless-steel chains are reduced by the following:
    * Power transmission Precision Roller Chain: Approximately 1/5
    * Conveyor Precision Roller Chains: Approximately 1/4
    * Conveyor Engineered Chains: Approximately 1/2
    * The corrosion resistance of martensitic chains is less than that of austenitic steels.
    * Speed limitation is 230 fpm

If there is a unique application which requires improved chain performance, please contact your chain manufacturer for special options which may be available to improve corrosion resistance and improve wear life of the chain.

The key to selecting the best chain for your application is determine the best material which will provide optimal balance of corrosion resistance and wear life. In the case of wear life, determine

the limiting factor such as chain elongation or roller/bushing wear and select the best material to address those requirements.