Exercise E223-S13-EXR-RV1.wpd

Installation, Alignment, and Tensioning of a Silent Chain Drive

Objective

- ❒ Using the IPT Industrial Trades Manual, the DAC Chain Drive Trainer, selected tools, and knowledge of chain drive components and terminology, properly install, align, and tension a chain drive using silent chain and silent chain sprockets.

Performance Standard

- ❒ Align sprockets to within 1/64" and tension the chain to have a “sag” equal to 2% of the center distance of the drive setup.

Foundation Competencies

- ❒ Use of hand tools.
- ❒ Knowledge of chain drive terminology. (Exercise E223-S01)
- ❒ Knowledge of chain types. (Exercise E223-S02)
- ❒ Knowledge of silent chain terminology (Exercise E223-S02)
- ❒ Knowledge of sprocket terminology. (Exercise E223-S04)
- ❒ Ability to install sprocket bushings. (Exercise E223-S05)
- ❒ Ability to use a dial indicator. (Exercise E223-S06)
- ❒ Ability to perform chain drive pre-checks. (Exercise E201-S07)

Required Background Reading

- ❒ IPT’s Industrial Trades Training Manual, pgs. 361-365 and 376-386. (DAC, #510-MAN)

Tools Required

- ❒ Combination wrench set.
- ❒ Hex wrench set.

- ❒ Roller chain breaker.
- ❒ Roller chain puller.
- ❒ 6" rule.
- ❒ Tape measure.
- ❒ Straightedge.
- ❒ Soft face mallet.
- ❒ Magnetic angle indicator.
- ❒ Needle nose pliers.
- ❒ Pencil and paper.

Components Required

- ❒ DAC Chain Drive Trainer, #223 and associated components.
- ❒ Silent chain and silent chain sprockets provided with training aid.

Introductory Discussion

Silent chain, also called inverted tooth chain, combines the flexibility and low noise of a belt with the positive drive characteristics of gears and the convenience and efficiency of a standard roller chain. Silent chain is usually used on high speed applications (over 4,500 FPM) requiring heavy load capabilities. Silent chains are commonly used in industrial fans, blowers, compressors, as well as various other types of heavy industrial machinery. Also, because of their accuracy and positive engagement with sprockets, silent chains are often used as timing chains.

The following exercise will describe the proper procedure for installing, aligning, and tensioning a silent chain drive. As with roller chain, the use of proper tools is necessary to assemble and disassemble silent chain, specifically, a chain puller and chain breaker. The procedure for installing, aligning, and tensioning silent chain should be performed using similar steps to those used with roller chain.

Silent chain drives, like all chain drives, cannot tolerate misalignment. For this reason, it is extremely important that the skills needed to align and install silent chains and sprockets be perfected. When silent chains and sprockets are properly installed aligned and tensioned, a silent chain can provide thousands of trouble-free hours of quiet, smooth-running service.

Performance Steps

- ✦ **Warning: When working on machinery in the field, always remember to lock out and tag out the power source to eliminate the risk of electric shock and/or injury due to moving parts.**

Step 1. Prepare the DAC Chain Drive Trainer for use.

- ❒ Using the Chain Drive Arrangement Drawing, install the motor element at position #2, the short position.

Step 2. Perform a preliminary alignment of shafts in the vertical plane.

- ❒ Prior to mounting sprockets, check for angular misalignment of shafts in the vertical plane. To do so use the magnetic angle indicator to measure the angle of the driven element shaft off horizontal. Then measure the angle of the motor shaft off horizontal. If angle readings differ more than 2°, adjustment will be necessary.

- ❒ Using shims from the shim kit, correct the motor element to make its shaft equal in angle with the driven element's shaft relative to horizontal. It is not necessary that both shafts be perfectly level.

- ✦ While both shafts could be leveled to ensure parallelism in the vertical plane, it is not necessary in order to align sprockets. Should both elements be greatly "off level", level both shafts.

Step 3. Perform chain drive pre-checks.

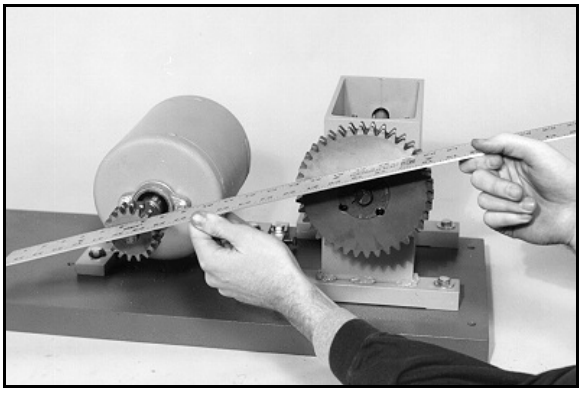
- ❒ To achieve accurate alignment and tensioning it is important to perform a standard set of equipment pre-checks. These pre-checks are performed to rule out any external factors causing chain drive malfunction. Use exercise E223-S07 as a guide if necessary. At a minimum, perform a sprocket run-out check using a magnetic base/dial indicator.

Step 4. Install and align the #404-17 and #404-38 sprockets on the DAC Chain Drive Trainer.

- ❒ The #404-38 sprocket requires the installation of bushings. Refer to exercise E223-S05, if necessary.

- ❒ Mount the #404-17 sprocket on the motor element shaft with its hub facing in. Mount the #404-38 sprocket on the driven element shaft with its setscrews facing out. Install shaft keys and tighten the setscrews.

❒ Using a straightedge, align the two sprockets. Hold the straightedge across the face of both sprockets while checking for space between the straightedge and the sprocket faces. When aligned, the straightedge will make full contact on each sprocket face. Contact at only one point on one or both sprockets indicates some type of angular misalignment in the horizontal plane. Full contact on one sprocket and none on the other sprocket indicates either parallel misalignment, extreme angular misalignment, or a combination of parallel and angular misalignment.



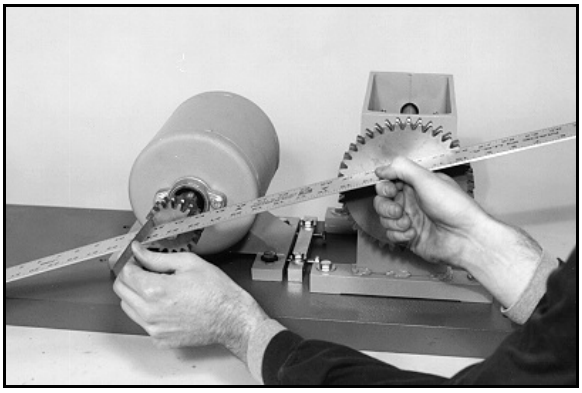
✦ Alternately, a taut string pulled in a straight line could be used to align the sprockets. As with a straightedge, the string should touch at two points on each sprocket face.

❒ Assuming some angular misalignment, loosen the hold-down bolts slightly and reposition the motor element using a soft-face mallet. It is sometimes useful to tighten one motor hold-down bolt and use it as a pivot to adjust the motor. Once angular misalignment of shafts and sprockets has been corrected, the straightedge should fully touch both sprocket faces, or more commonly, it should be in full contact with one face and parallel to the other.

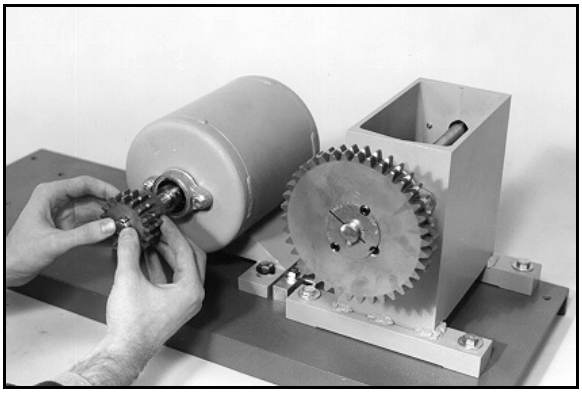
✦ Note that parallelism of shafts in the horizontal plane can be achieved by accurately measuring the distance between the shafts at each end, or by creating a gauge and inserting it between the shafts at both ends. These methods are more efficient than relying on a trial and error approach.

❒ To correct for parallel offset misalignment of sprockets, hold the

straightedge against one sprocket face and measure the gap created at the other sprocket face.



❒ Use sprocket location on the shaft to adjust for parallel offset misalignment of sprockets (axial misalignment of the shafts). Loosen the setscrew on one sprocket and adjust the sprocket until the straightedge touches each sprocket at two points, or is flush with both faces.

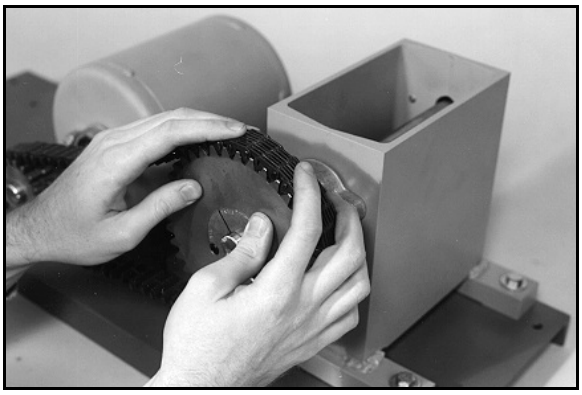


❒ Once the sprockets are aligned within 1/64", anchor them to the shafts by tightening the setscrews. Tighten the motor hold-down bolts to keep the motor from shifting. The slightest shift of the motor element will cause misalignment.

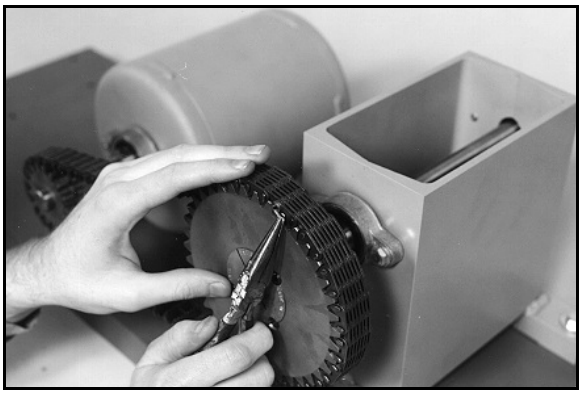
✦ As a general rule, chains tolerate virtually no misalignment. Alignment should be as close to perfection as possible. Wear on a chain caused by misalignment can dramatically reduce the life of a chain.

Step 5. Install the 1" wide silent chain on the chain drive.

❒ Install the chain by wrapping it around both sprockets and bringing the two free ends together on one of the sprockets. Make sure that the link plates are properly meshed.



❒ Insert the connecting pin and rocker to join the ends of the chain together, install the washer and the cotter pin using needle nose pliers. The ends of the cotter pin should be bent to approximately 45 degree angles. Consult the link pin installation instructions provided with the silent chain, if necessary.

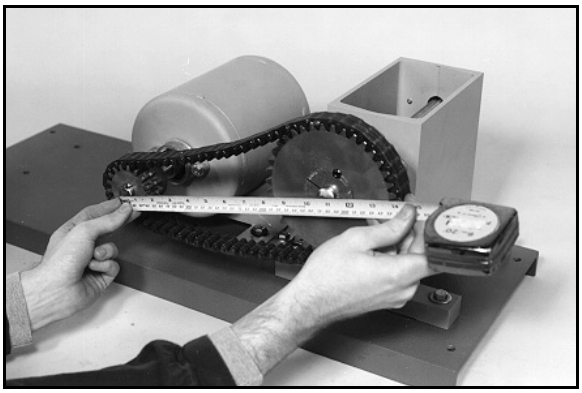


Step 6. Tension the chain to the proper specification.

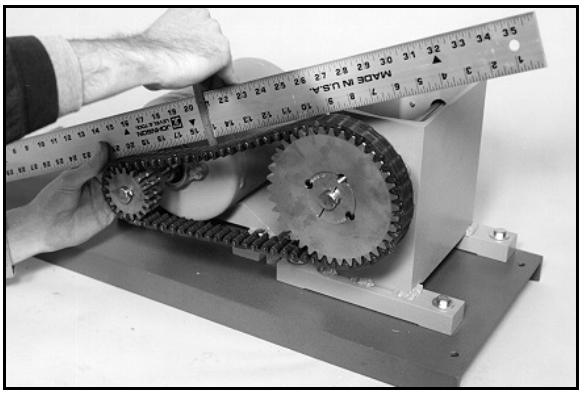
❒ Because of the positive engagement between sprockets and chains there is no specific tension needed to power a chain drive. However, if a chain is too loose it will whip, cause unnecessary vibration, and shorten the overall life of a chain. The term used to describe how tight a chain should be is “sag”. Sag is the droop found on the slack side of a chain when not in service. To obtain optimum chain drive efficiency, chain sag

should be equal to 2% of the center distance of the chain drive setup.

❒ Measure the center distance of the current drive arrangement, and make a note of your findings.



❒ To obtain the proper chain sag, tighten the jacking bolts alternately and evenly until the chain is snug, but not overly tightened. Use a string or straightedge and place it across the top of the chain strand. Use a 6" rule to push the chain down until the slack is tightened, but do not use great force. Once the slack of the chain is tightened, measure the gap between the bottom of the straightedge or string and determine the amount of sag. Using the jacking bolts, adjust the chain until the sag is equal to 2% of the chain drive center distance. For example, if the center distance between shafts was 50" the proper amount of chain sag would be 1".



✦ It is important to note that when a chain is too tight the drive carries extra load without transmitting additional power within

the drive. This causes the driving parts, including the chain, to wear prematurely and may eventually cause drive failure.

Step 7. Re-check alignment.

❒ Because the motor tends to shift slightly at its feet when tightened, it is important to re-check alignment. If misalignment is present, perform the steps discussed in this exercise to correct it.

✦ Because chains cannot tolerate much misalignment, alignment must be achieved to within 1/64".

Step 8. Return the DAC Chain Drive Trainer to its standard configuration.

❒ Remove shims, if any, from beneath the motor feet.

Summary

You have just successfully installed, aligned, and tensioned a chain drive using a silent chain and silent chain sprockets. The procedure of installing, aligning, and tensioning sprockets and chains on a chain drive is the most important task a mechanic must perform when maintaining a chain drive.

The most important things to remember when installing, aligning, and tensioning silent chains and sprockets on a chain drive are: chain sag should be equal to 2% of the center distance of the chain drive; when disassembling links never force the link pin entirely through the link plate as this will damage the chain; always use the proper tools for the assembly and disassembly of chains; and, most importantly, always take great care in aligning sprockets because chains tolerate virtually no misalignment.

As with all maintenance, following a fixed standard procedure when installing, aligning, and tensioning sprockets and chains on a chain drive will lead to long sprocket and chain life, optimum levels of chain drive performance, and reduced downtime. Proper chain drive maintenance will save a great amount of time, money, and energy.

Optional Tasks

❒ None.

Follow-on Exercises

❒ None.

Resources

Basaraba, Bruce M., IPT's Industrial Trades Training Manual. Edmonton, Alberta, Canada: IPT Publishing and Training, Ltd., 1989.

Morse Industrial Corporation. Catalog CD-87 Chain Drives. Florence, Kentucky: Morse Industrial Corp. 1987. Pgs. 2-10, 34-5, 126-7, 143-6.

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Technical Resource Group, Jobmaster Training Series, Module 681, Chain Drives. Nashville:Technical Resource Group, 1994.