The Line Boring Book by Earl Hansen

Excerpt from ***Chapter 1:***

Precision Machine Boring

A. What is Line Boring? How Does it Work?

Portable line boring is a process by which very heavy machinery—too heavy or too costly to move to a machine shop—can be repaired in the field, restoring bearing bores and pin IDs (inside diameters), and virtually any ID to factory specifications. It's also an excellent method for new manufacturers in semi-production plants to bore almost any size bore, at any angle, to very close tolerances.

This is a diversified method of precision boring. It is fast and precise, and when combined with precision honing, the degree of accuracy gives superior results. The onsite repair capability saves expensive down time and transportation costs. These advantages make precision line boring very cost-effective.

In new product production or repair, you will be able to set up and quickly produce very large cuts. For example, in the first pass through a heavy welded inside diameter, a cut of 1.000" total stock removal through a multiple of 4 IDs, 6.750" in diameter, each 4" long, using a hand-feed system allowing the feel of the cut, the typical time for each pass averaged about ten minutes. At this rate, it will take only forty minutes to remove 1/2" per side or 1.000" total stock from a bore 16" long. That's remarkable boring!

You will be able to produce multiple series of inline bores within .001" positioning tolerance with multiple bore locations. A gear train is an excellent example of this type of precision line boring. (See Chapters 8 through 10)

Used properly, portable precision line boring can eliminate the need for boring mills to bore inside diameters. It is less expensive and faster than any other method for repairing very large machinery. Example: A machine 8' wide × 20' high × 60' long required restoration of four bores with inside diameters of 13.000", each 3" deep, matched to identical bores 44' apart. This is just average line boring, and there's very good money to be made in such precision line boring.

B. What is End Boring? How does it work?

An end-boring machine is set up at one end of a bore, reaching into the bore from one side, and boring without any support bearings to stabilize the spindle. These machines are discussed in detail in the blueprint section MA-105, 105A–105E. They are very heavy-duty machines, and will perform for many years. I have bored very large inside diameters where line boring would be impossible (see Chapter 5, "How to Build Hydraulic End-boring Machines").

Excerpt from ***Chapter 5:***

How to Build Hydraulic Boring Machines

Constructing a hydraulic boring machine is not difficult. You will need a number of off-the-shelf items that are readily available plus a few parts made in a machine shop. Making the machined parts is not complicated. Anyone who is mechanically inclined, familiar with machines and with access to a lathe and a milling machine, can easily follow the blueprints and instructions. (See Chapter 14, “Operating Lathes, Milling Machines, Drilling Layout and Tapping”.)

Very Important: This chapter includes a list of DODGE torque-arm shaft-mounted speed reducers with dimensions. Boring bar shaft sizes vary from 1 7/16" to 10" outside diameters (OD) on both the TXT double-reduction straight bore and the TXT single-reduction straight bore. The difference between a double and single reducer is the speed and torque produced by each unit.

Building Dozens of Different-Sized Boring Machines

The speed reducers listed in this Chapter—with varied shaft sizes—make it possible to construct a wide array of boring bars for a broad range of capabilities. Thus it is possible, in a short time, to create boring systems of immense size, capable of boring inside diameters measured in feet, yet holding critical tolerances of .001". The blueprint section provides the details of tooling that can be adapted to very large line-boring systems.

Note:

This Chapter lists detailed factory specifications for speed-reducer sleeves made to fit the inside diameter of one speed reducer. Thus, many sizes of boring bars can operate perfectly in just one speed reducer. Part numbers are given for ordering the correct sizes. Be sure not to order the tapered sleeve system. They are designed to grip the bar firmly and would not allow the in-and-out sliding movement needed to perform line boring.

Tapered bushed reducers are also listed, but these should not be used. The shaft must slide freely through the speed reducer, which will not happen with a tapered bushed reducer, because they are designed to lock the shaft rigidly to the reducer.

Detailed Information on How to Assemble the System

Blueprints MA-100, 101, and 101A show the boring bars from 1" to 1 15/16" ODs in varying lengths with keyway dimensions, hole layouts, and other specs. Note: These details can vary to accommodate any size boring system necessary.

Recent Research ***(Page 9)***

For many years, I have accumulated information and experience in line boring. I have continued to acquire knowledge since this book was completed. For example I was speaking with a man who is an expert on the subject of very small speed reducers driven by hydraulic motors as are used in hydraulic-feed systems. He mentioned a company that tests the point at which different alloy bolts of varying sizes will break. He said they use a very large hydraulic motor with a large internal capacity (58.5 displacement cu. in.) which operates at 1000/1500 psi at 20 gallons per minute. The torque developed by this motor is not dependent on volume but only on pressure developed. The torque is 6,843 in. lb. on a continual run, and 11,227 in. lb. on an intermediate load—that is a very powerful dynamic motor.

If an adjustable restriction valve is mounted on the exhaust end of this hydraulic motor, allowing the full force of the internal pressure to develop the torque, the speed of the motor can be reduced from 76 rpm to as low as 1 or 1 1/2 rpm, with over 6000 inch-pounds of torque. The possibilities of this range in the line-boring industry could be dynamic. The man said that internal hydraulic blow-by would not become a problem until the motor began to wear out. My research on this subject, and on other line boring possibilities, will go on, and I'll pass along the information I obtain to those who purchase this system.