

# Forest City Tool's Hole Boring System & Accessories

Forest City Tool has been a leader in the manufacturing of industrial hole boring and cutting tools since 1890. This expertise, dedication to quality, and commitment to USA manufacturing is now available for the boat manufacturing and composites industries.

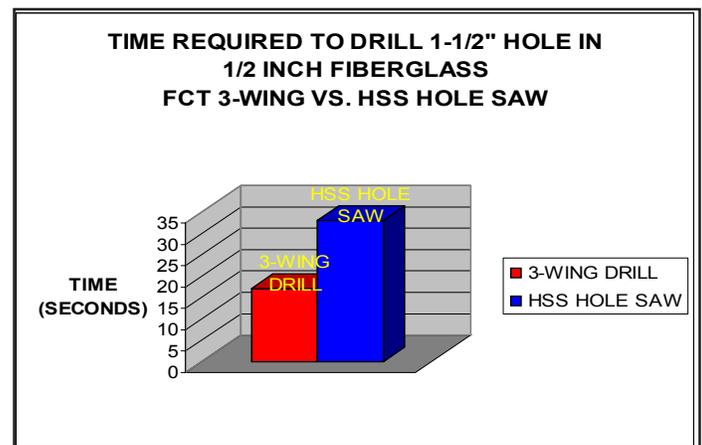
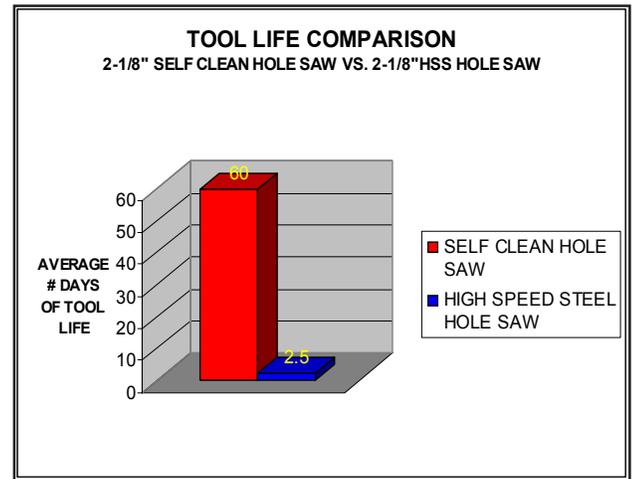
## Test Data and Summary of Results for Forest City Tool's Quick Change Hole Boring System & Accessories

**Objective:** To provide real world data substantiating the performance and cost effectiveness of the Forest City Tool "Quick Change Hole Boring System" in comparison to traditional tools used in the boat building & composites industries. The FCT system that includes the patent pending Self-Clean™ hole saw, 3-wing drill and transom drill were tested head to head with standard bi-metal hole saws and high speed steel jobber drills.

**Testing:** Testing was performed over a 3 month period in an actual marine manufacturing plant that produces 75 boats per week. The tools tested were a Forest City Tool 8002125 Self-Clean™ hole saw (2-1/8" diameter), 8031500 1-1/2" diameter 3-wing drill, and an 8040562 9/16" diameter transom drill. The FCT tools were tested against a Starrett 2-1/8" diameter bi-metal high speed steel hole saw, a Starrett 1" diameter bi-metal high speed steel hole saw, and a high quality 9/16" high speed steel jobber drill. All tools were tested using identical Sioux pneumatic drills turning at approximately 1800 rpm. The fiberglass thickness was approximately 1/2" thick, and the transom material consisted of layers of fiberglass and marine plywood sandwiched together with a total thickness of approximately 2.5". All of the tools within the FCT system were equipped with the quick change system. The Starrett hole saws were equipped with the screw on/off mandrel system.

**Hole Saw Testing Results:** Over the 3 month period, the 2-1/8" Forest City Tool Self-Clean™ hole saw drilled approximately the same number of holes as did 24 of the standard bi-metal hole saws in the same material. The Self-Clean™ drilled approximately 2.5 times faster than the bi-metal saw and reduced gelcoat chipping to nearly non-existent levels. The Self-Clean™, due to its patent pending design that allows the waste fiberglass plug to simply fall out, saved approximately 15 seconds per hole because the worker did not have to spend time extracting the plug from the saw. The bi-metal saws were cumbersome to use because each time a hole was sawed, the worker needed to dismantle the mandrel from the saw and "dig" the plug out of the holesaw, thus wasting valuable time. When comparing methods of changing from one hole saw to another, the FCT system is superior. The FCT system allows workers to simply snap one saw off and snap another one on. The mandrel system required the worker to unscrew the holesaw from the mandrel and screw another one on which took on average 15 seconds longer than the FCT system.

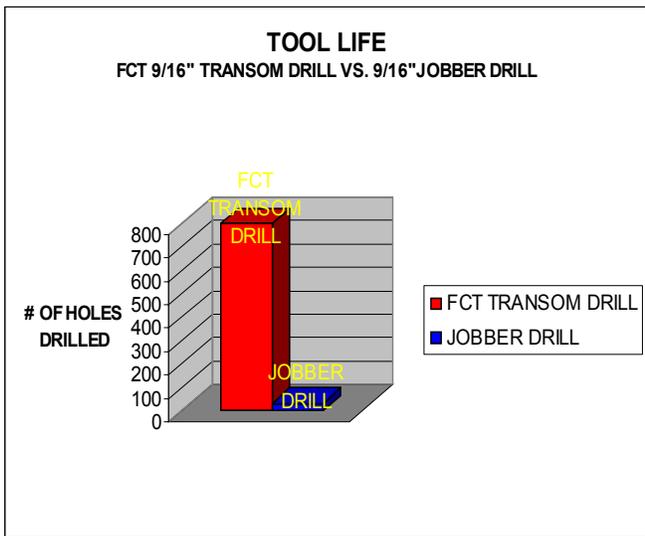
**3-Wing Drill Testing Results:** The FCT 3-wing drill was tested in a similar fashion as the Self-Clean™ hole saw. The 1-1/2" diameter 3-wing drill drilled through 1/2" fiberglass in approximately 7.5 seconds whereas the 1-1/2 inch hole saw took 17 seconds to drill the hole and 16 seconds to extract the plug from the saw. Because



the 3-wing drill doesn't produce a waste plug like the hole saw, a great deal of time was saved. Again, as with the Self-Clean hole saw, changing the quick-change 3-wing drill to another was easier and faster than the mandrel system. The 3-wing drill also produced a much cleaner hole with less gelcoat chipping than the hole saw. Tool life comparisons between the two tools were very revealing. Like the Self Clean hole saw, the FCT tool drilled approximately 20 times as many holes as the high speed steel holesaw.

**Transom Drill Testing Results:** The FCT part # 8040562 9/16" diameter transom drill was tested against a high quality Precision Twist 9/16" diameter high speed steel jobber drill. Both drills were tested drilling the 8 gimbal bracket mounting holes that are required to attach a Mercruiser sterndrive to the transom of the boat. The standard Mercruiser drilling bracket with drill bushings was used to guide the drills. The FCT Transom Drill would drill the holes in the transom in about half the time

that the high speed steel jobber drill could perform the same task (14 seconds vs. 26 seconds). The reason that the FCT Transom Drill performed much better than its counterpart is due to the "climbing" flute design. The FCT drill cut straight through the transom without backing out or "pecking"; whereas, the high speed steel drill packed chips in the flutes and required the operator to work the drill in and out of the bushing to clean the chips out. The difference in performance of the two tools was quite dramatic; however, the difference in tool life could be characterized as unbelievable. Over the 3 month period, the high speed steel jobber drill averaged approximately 32 holes per drill or about 4 boats. The FCT transom drill cut an astounding 800 holes or 100 boats,

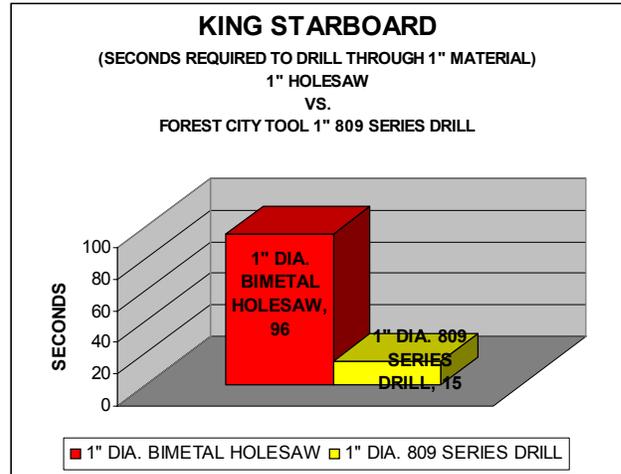
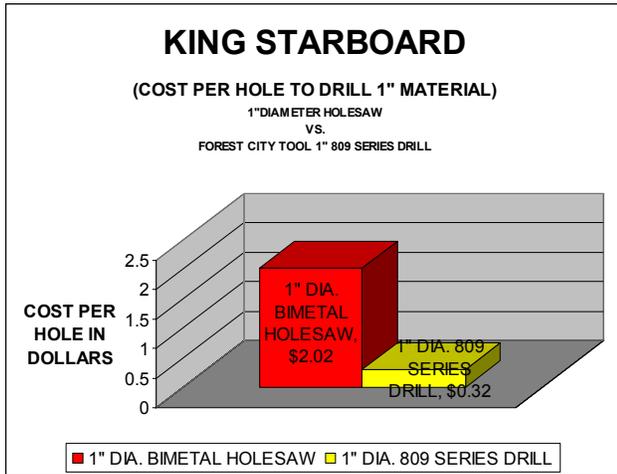


and then was sent back to the factory for re-sharpening! As with the Self-Clean hole saw and 3-wing drill, the FCT transom drill also has a quick change shank that makes changing the drill easier than chucking and un-chucking a standard jobber drill.

**Summary:** In head to head testing of the Forest City Tool Hole Boring System against standard hole saws and jobber drills typically used by manufacturers today, the FCT system is clearly, the hands down better product. The FCT products were tested in a real world marine manufacturing environment and subjected to all of the abuse that the traditional tools endured and emerged as an innovative solution to many of the problems that manufacturers face daily. The tools were superior in all areas of testing, ease of changing tools, speed of cut, tool life, quality of cut, and ability to recondition after the tools were spent. Forest City Tool has engineered into its unique Hole Boring System all of the tools needed to reduce labor, cut costs, increase productivity, and remain competitive.

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**809 SERIES 3-Wing Drills:** When testing a 1" diameter 809 drill against a 1" diameter hole saw in King Starboard it took over 1-1/2 minutes to drill completely through the material with the traditional hole saw while it required an astounding 15 seconds to drill the same material with the 809 series! As one William F. Miller customer said after seeing the 809 series drill through 1" thick King Starboard, "we gotta have this thing"! Performance test results are outlined below.



**Figure 1** NOTE: COST SAVINGS BASED ON A \$75.00/HOUR SHOP RATE

**Hydraulic Tool Holder:** The graph below represents actual data gathered at a major marine manufacturer. Testing was performed using a Forest City Tool 1/2" solid carbide compression router bit first being run in a standard ER32 collet chuck and then in a Forest City Tool precision hydraulic tool holder. The machine was a 2005 model Fanuc multi-axis robot cutting fiberglass dashes and other small parts. Tool life increased from 40 parts per bit to 91 parts per bit. An amazing 127% increase in tool life by just changing the tool holder.

