Core-Cutoff Tool

Damage and waste are reduced.

John F. Kennedy Space Center, Florida

A tool makes a cut perpendicular to the cylindrical axis of a core hole at a predetermined depth to free the core at that depth. The tool does not damage the surrounding material from which the core was cut, and it operates within the core-hole kerf.

Coring usually begins with use of a hole saw or a hollow cylindrical abrasive cutting tool to make an annular hole that leaves the core (sometimes called the “plug”) in place. In this approach to coring as practiced heretofore, the core is removed forcibly in a manner chosen to shear the core, preferably at or near the greatest depth of the core hole. Unfortunately, such forcible removal often damages both the core and the surrounding material (see Figure 1). In an alternative prior approach, especially applicable to toxic or fragile material, a core is formed and freed by means of milling operations that generate much material waste. In contrast, the present tool eliminates the damage associated with the hole-saw approach and reduces the extent of milling operations (and, hence, reduces the waste) associated with the milling approach.

The present tool (see Figure 2) includes an inner sleeve and an outer sleeve and resembles the hollow cylindrical tool used to cut the core hole. The sleeves are thin enough that this tool fits within the kerf of the core hole. The inner sleeve is attached to a shaft that, in turn, can be attached to a drill motor or handle for turning the tool.

This tool also includes a cutting wire attached to the distal ends of both sleeves. The cutting wire is long enough that with sufficient relative rotation of the inner and outer sleeves, the wire can cut all the way to the center of the core.

The tool is inserted in the kerf until its distal end is seated at the full depth. The inner sleeve is then turned. During turning, frictional drag on the outer core pulls the cutting wire into contact with the core. The cutting force of the wire against the core increases with the tension in the wire and, hence, with the frictional drag acting on the outer sleeve. As the wire cuts toward the center of the core, the inner sleeve rotates farther with respect to the outer sleeve. Once the wire has cut to the center of the

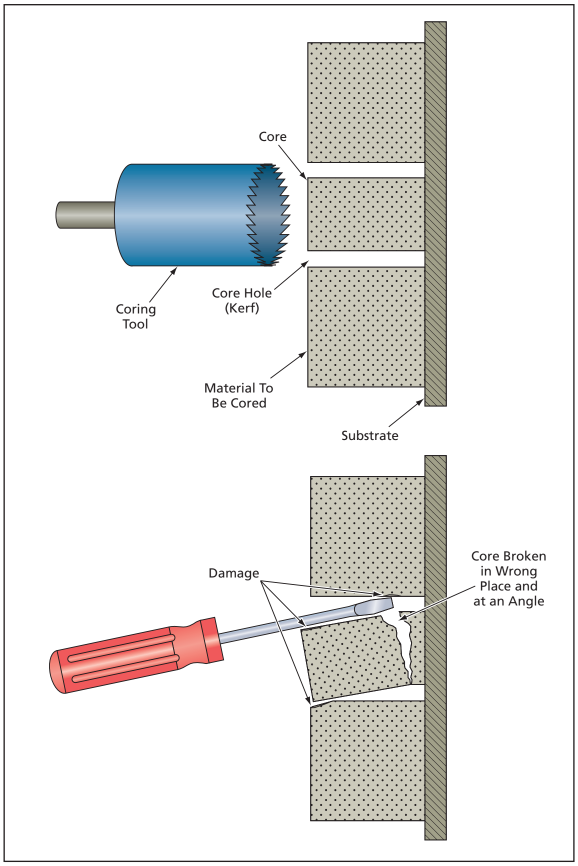

Figure 1. A **Core Remains in Place** after cutting a hole around it. Forcible removal of the core (in this case, by prying with a screwdriver in the kerf) can damage both the core and the surrounding material.

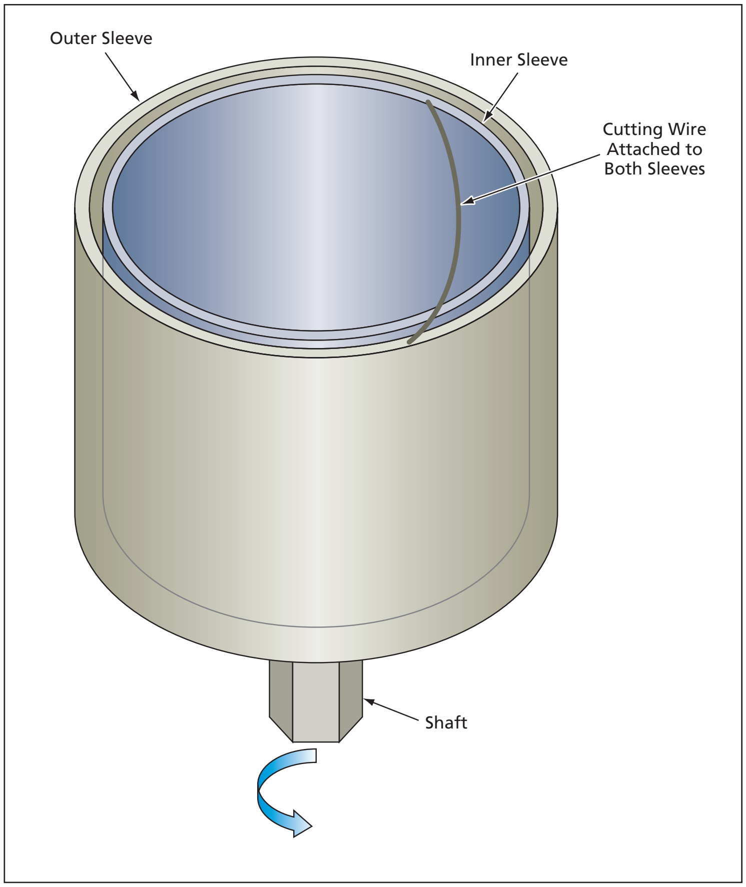

Figure 2. The **Core-Cutoff Tool** is designed to operate entirely within the kerf so as to free the core while generating minimal waste and not damaging either the core or the surrounding material.

core, the tool and the core can be removed from the hole.

The proper choice of cutting wire depends on the properties of the core material. For a sufficiently soft core material, a nonmetallic monofilament can be used. For a rubberlike core material, a metal wire can be used. For a harder core material, it is necessary to use an abrasive wire, and the efficiency of the tool can be increased greatly by vacuuming away the particles generated during cutting.

For a core material that can readily be melted or otherwise cut by use of heat, it could be preferable to use an electrically heated cutting wire. In such a case, electric current can be supplied to the cutting wire, from an electrically isolated source, via rotating contact rings mounted on the sleeves.

This work was done by Darrell Gheen of United Space Alliance LLC for Kennedy Space Center. For further information, contact the Kennedy Innovative Partnerships Office at (321) 861-7158.
KSC-12600