Shell Inspection

Product

ThermoFlex Wide II

Machines affected Sleeve capable devices

Background

Shells undergo normal wear and tear due to the repeated loading and unloading of sleeves. There is also a high risk of shell damage due to the frequent movement between the device and the shell storage location. The performance of a shell can degrade to a point where it should be refurbished or replaced. This procedure will help to determine the condition and quality of a shell.

Tools required

- Dial indicator with a resolution 2 μm/div or better
- Dial indicator stand with a magnetic base
- 400 grit emery paper

Checking the shell bushings

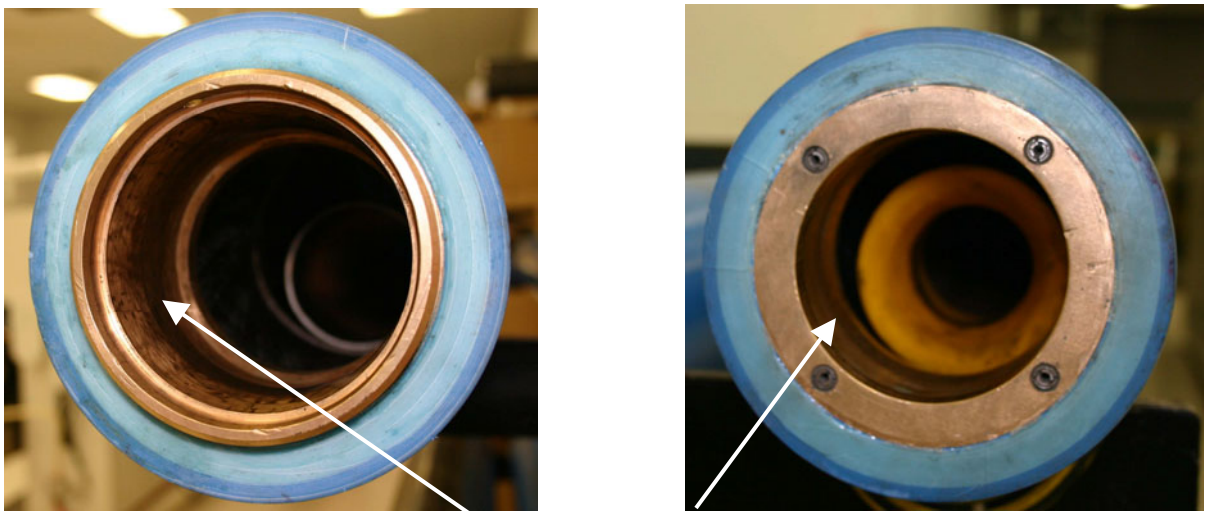
Depending on the severity of damage or wear that the bushings have experienced, they may either require simple corrective action or the shell will need to be withdrawn from use and replaced.

1. Check the safety ring on the headstock bushing for damage due to rough handling or dropping.
2. If there is minor damage, use a hammer and a small block of soft material such as aluminum or brass to remove dents that will prevent the shell from loading onto the arbor.
3. If the ring is completely malformed, the shell should be withdrawn from use.
4. The precision bore is the length of the bore that extends from about 40 to 60 mm from the end of each bushing. Check the bore for damage and scratches.
5. Remove any scratches or gouges that stand out of the bore surface using fine emery paper with light pressure in a circular pattern.
6. If the bore has been severely damaged to the extent that it will not load onto an arbor, the shell should be withdrawn from use.

7. The wear ring is the ring that supports the shell during loading, transport, or storage. It is the smallest diameter on the internal bore of the bushing and extends to a length of about 12 mm from the tailstock side of each bushing. Because the wear ring provides a surface for the shell to slide on, it must be checked for excessive wear.

   Visually inspect the wear ring to determine if the device and shell loading shafts have been kept clean as specified in the operator manual.

Headstock End **Tailstock End**



Inspect inner surface for wear

8. If there is a buildup of debris on the wear ring, or if the ring has deep scratches, clean the bushing inside diameter with isopropyl alcohol and instruct the operator on the proper cleaning procedures.
9. If either ring is severely damaged so that it cannot be loaded onto a shell shaft or arbor, the shell should be withdrawn from use.
10. If the ring has been worn down to the level of the precision bore, so that both contact the shell shaft, the shell must be withdrawn from use.

Checking the outer surface of the shell

A certain amount of wear on the exterior surface of the shell is normal, but if it affects the loading and unloading of sleeves, the shell must be refurbished. Small scratches and abrasion marks can also be tolerated. When checking the operation of a shell, a good quality, undamaged sleeve must be used. Use the following guidelines to determine the condition of a shell.

1. If there are any serious scratches that are causing loading/unloading problems, the shell should be sent for refurbishment.
2. Check for flat spots near the tailstock end of the shell that could be caused by the shell being dragging across a rough surface.
   a. Load a short sleeve without an end cap a minimum of 127 mm (5 in.) onto the shell.
   b. Feel the air flow coming out of the gap between the end of the shell and the sleeve. If there is significant air escaping in one location, as opposed to an even flow all around, there is a good chance that the shell has been damaged and requires refurbishment.

3. Over time the tail stock end of the shell may wear down due to frequent loading and unloading of sleeves. If it wears a significant amount, it can cause loading problems. The easiest way to determine if the shell is worn to the point that it requires refurbishment is to push a sleeve onto the shell. If it goes on very easily initially, but then becomes increasingly more difficult to load, to the point that it is very difficult to move or rotate the sleeve, the shell may have a problem. To verify, hold a straight edge against the surface of the shell parallel to the axis near to the tailstock end of the shell. There should be no gap visible beyond the set of air holes closest to the end of the shell. If it appears that the shell tapers near the chamfer, and the sleeve loading tests indicated a problem, send the shell for refurbishment or contact the product specialist.
4. Repeated use or abuse can cause the outer surface of the shell to lose its accuracy over time. Initial indicators that this is a problem may show up as imaging problems or auto focus errors. There are several ways to check for the quality of the surface. One method is to use a dial indicator mounted to the front carriage track to measure the runout of the shell in a number of positions.
    a. Release the hydraulic pressure by backing off the hydraulic screw until it contacts the stop.
    b. Increase the pressure slowly, until the arbor just begins to grip the shell. Do this by rotating the shell on the arbor while increasing the hydraulic pressure until the shell becomes difficult to move on the arbor.
    c. Mount the dial indicator to the front carriage track and set up the indicator to measure the runout of the shell in the horizontal direction (approximately at the height of the write spot). For help setting up the dial indicator and magnetic stand, see steps 6 and 7 of the procedure: *Finding an arbor's optimum position*, except locate the indicator in the position indicated.
    d. Turn the arbor slowly while noting the reading of the dial indicator. If the full indicator movement is less than 40μm the shell is ok, and the rest of this procedure is not required, but if it is greater, check the arbor for runout and quality problems. See *Arbor Inspection*.
    e. If the arbor is bad, get a good one and recheck the runout of the shell. If the runout is more than 40μm, the shell may still be used if it is not causing any problems, but if there are registration, auto-focus, or other problems related to the runout of the shell, it should be refurbished or replaced as soon as possible.

See also	Finding an arbor's optimum position Arbor inspection
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Date submitted	22 Jul 2004
Last updated	18 Sep 2007