SO – SEPARATOR CARTRIDGES

1. Turn off the pump. Close the inlet and outlet valves to the filter/separator vessel.
2. Open the air eliminator or manual vent valve and drain the vessel through the bottom drain.
3. Open the vessel and remove the old separator cartridges.
4. Cut the new cartridge's protective poly-bag at both ends.
5. Holding the new cartridge with the poly-bag still protecting the cartridge, place the cartridge over the tie-rod. (The poly-bag protects the cartridges from being disarmed by handling.) DO NOT TOUCH THE SEPARATOR MEDIA. [Separators should be installed after the coalescers are installed, to prevent damage to the separators.]
6. Remove the poly-bag slowly from the cartridge after it is in place.
7. Place the end cap over the tie-rod. (Not needed on SO-3xxV, SO-4xxV, SO-6xxVA, SO-6xxV and SO-6xxPV separators which have blind end cap already affixed.)
8. Place the new flat gasket over the tie rod. Discard the old gasket.*
9. Place the flat washer, lock washer, and nut over the tie rod and tighten to 3-5 foot-pounds of torque. (Lockwasher will be flat). *
10. Make sure separators are evenly spaced and not touching each other or the vessel wall by following these steps:
11. Make sure that no poly-bags remain in the housing, then replace the spider as follows:
    - Install the flat washer over each cartridge end and install the spider over the ends of the cartridges.
    - Affix the spider to the threaded clips on the vessel walls using the nut and lockwasher.
    - Adjust the spider clip nuts, so the spider lies flat on the ends of the cartridges
    - Install the washer and nut over the ends of the cartridges, to affix the spider to the cartridge ends. Snug the nuts. DO NOT TIGHTEN YET.
    - Adjust the ends of each cartridge to create even separation between the cartridges and between the cartridge and vessel wall. Cartridges should NOT be touching each other, nor touching the vessel wall. The ends of the cartridges can be shifted within the spider plate holes as follows:

Cartridge Length	Shift Within the Spider Hole	
Greater than 33"	Full movement within the spider hole	
30"	Less than 5/8"	(16 mm)
28"	Less than 9/16"	(14 mm)
24"	Less than 1/2"	(12 mm)
22"	Less than 1/2"	(12 mm)
20"	Less than 3/8"	(10 mm)
18"	Less than 3/8"	(10 mm)
16"	Less than 5/16"	(8 mm)
14"	Less than 1/4"	(6 mm)
11"	Less than 3/16"	(5 mm)
9"	Less than 3/16"	(5 mm)

    - When the cartridges are spaced properly, tighten the spider nuts to 5 ft-lbs.
12. Inspect the cover gasket and replace it if necessary. Tighten the cover securely in a cross-pattern process. Follow procedures listed on Bulletin 1935, on back of this form.
13. Close the bottom drain valve and start the system pump.
14. With the outlet valve closed, slightly open the inlet valve and allow the vessel to fill **SLOWLY** with fuel until the air eliminator closes or fluid begins to flow from the manual air vent. Close the vent valve. Fully open the inlet valve. Open the outlet valve **SLOWLY**.
15. When the unit is operating, check the differential pressure across the cartridges. There should be indication of positive pressure, normally 1-5 psid. This insures that all seals have been properly made during the installation.
16. See Form VEL1242 for Teflon® Coated Screen Separator Cleaning Instructions.

* As a recommended alternative to the flat gasket, washers, and nut when using 3/8" diameter tie rods, Parker AFD offers part number K20A separator seal nut. This has an O-ring in its base to provide the seal. Tighten to 5 ft-lbs of torque.

PLEASE NOTE: The normal shelf life for pleated paper separators (for example, SO-xxxPLF3 and SO-6xxPLBZ) is ONE YEAR from the date of manufacture.

However, pleated paper separators can be used beyond the one year shelf life and will work properly providing they have been kept clean & dry, & stored in their original poly bags & boxes. Before installing pleated paper separators, closely examine the separator media for any damage that may have occurred during storage or handling. Contact Parker AFD if you have any questions.

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TORQUE REQUIREMENTS FOR VESSELS WITH "0-RING CLOSURE"

Bolted pressure vessel closures operate on the premise that the joint is clamped closed with a force sufficient to resist the internal pressure yet still maintain a seal. The clamping force, or pre-load, is applied by the closure bolts and its magnitude is controlled by the torque applied. Application of the correct preload is essential to maintaining a positive seal and avoiding closure failures from fatigue or overstressed vessel components.

The short term, and most obvious effect of grossly under-torqued bolts is insufficient clamping force resulting in a leaking closure. A more ominous result of under-torqued bolts in systems which see a great number of pressure cycles (such as refuelers, loading racks etc.), is bolt fatigue failure. Repeated applications of stress to the bolt eventually create a small crack at the surface of the bolt which continues to grow until the bolt breaks and the closure fails.

It is a good idea to re-torque the closure bolts after they have been in use for a month or so to ensure the joint has not "relaxed" and the preload reduced.

Over-torquing closure bolts will result in breaking or bending vessel bolt clips or actually breaking the bolt itself. Table One lists guideline torque values for lubricated bolts for common sizes used for vessel closures. Always use lubricated bolts, as this reduces the required torque, improves torque accuracy, and retards corrosion.

TABLE ONE*	
Bolt Diameter mm (in.)	Recommended Torque m-kgs (ft-lb)
13 (1/2)	**3** (20)
19 (3/4)	**6** (45)
25 (1)	**14** (100)
32 (1-1/4)	**22** (160)
38 (1-1/2)	**36** (260)

**NOTE: These recommended torque values are only for vessels with an O-Ring closure.*

A common cause of inaccurate bolt torque is inappropriate bolt torquing procedures. Key elements to the procedure are application of the torque in stages and in a specific cross-torquing sequence. For most applications, torque is applied to all bolts to 30% of full torque, then to all bolts to 60% of full torque, and finally to all bolts to 100% of full torque. Each torquing cycle is carried out in the applicable cross-torquing sequence. Torquing sequences vary with the number of bolts on the cover.

The tightening pattern is as follows: Tighten two bolts diametrically opposite from each other, then tighten a second pair of bolts diametrically opposite each other, approximately 90 degrees away from the first pair, and so on until all bolts have been tightened.

Using a clock as an example, the sequence would be: 12, 6, 9, 3, 11, 5, 10, 4, 7, 1, 8, 2.

On large vessels, the cross-torquing process is tedious but the addition of a second operator applying torque improves the situation vastly.

Correct closure torquing will result in many years of trouble-free vessel operation. Occasional inspections for bolt cracks or clip damage is good practice to detect possible closure problems before they occur. More detailed or specific information on bolt torquing requirements and procedures can be obtained by calling +1 719 531 5855.

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