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# SECTION 1

## OPERATION/MAINTENANCE GUIDE

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### WAVE-300E-4

## **DANGER - High Pressure Device**

This vessel may cause loss of life, severe bodily harm, and/or property damage if not correctly installed, operated and maintained. Read and understand all guidelines given before attempting to open, service or operate this vessel.

Failure to follow these guidelines and observe every precaution may result in malfunction and could result in explosive head failure.

Misuse, incorrect assembly or use of damaged or corroded components can result in explosive release of the end closure.

We recommend that only qualified mechanics, experienced in servicing high pressure hydraulic systems, open, close and service this vessel.

This section is a guide to proper operation and maintenance of Wave Cyber pressure vessel series. Good industrial practice must be used in applying this information to assure safe vessel use. These guidelines are not intended to relieve the user from full responsibility for correct operation and maintenance of the vessels.

For technical specifications and dimensions, refer to the Engineering Drawing of each specific model.

The information in all sections must be carefully followed for the vessel to provide the safe, long service life for which it is designed.

Proper vessel handling and installation are important to safe use and long vessel life. These guidelines should be followed carefully; however, they do not relieve the purchaser from full responsibility for proper inspection, handling and installation. Damage due to improper handling or installation is the sole responsibility of the purchaser.

Improper assembly, misuse or corrosion damage can result in mechanical failure, property damage and serious injury or death. **Read and follow all instructions carefully.** Pay particular attention to the safety precautions given in this **Operation /Maintenance Guide section**. Should any information in this guide not agree with the system supplier's instructions, call Wave Cyber for clarification.

Corrections or recommendations for improvement of this manual should be addressed to:

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## SECTION 2

### SUITABILITY FOR INTENDED USE

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Wave Cyber 40 series MPV pressure vessels are designed for continuous, long-term use as housings for reverse osmosis membrane elements. Models are available for 150, 300, 450, 600 and 1000 PSI. The allowable temperature is  $-7^{\circ}\text{C}\sim 49^{\circ}\text{C}$ . Any standard four inch nominal diameter spiral wound element with 1 inch in length, 0.75 inch in diameter and 38 inch in effective length is easily accommodated.

The filament wound FRP shell is composed of continuous fiber glass impregnated with heated epoxy resin system. The allowable water PH range is 3-10 under normal operating conditions and 2-12 when the vessel is periodically cleaned. Cleaning agents must be wiped off and cleaned from the vessel after periodical cleaning. For the material list of vessel, refer to the Engineering Drawing of each specific model.

In an RO system there is considerable potential for explosive head failure, which could result in serious injury or loss of life. All decisions as to suitability for use must include full consideration of the various safety aspects involved. These include, but are not limited to:

- Process fluid compatibility (e.g. chemical and temperature considerations).
- External environmental factors (e.g. corrosive atmosphere; remote or special environments where plastics might be undesirable; etc.).
- Abnormal back pressure which might result in pressurizing permeate port above 125 PSI (alternate materials are available).
- Capability of the user to maintain vessel properly.
- Requirement for increased fire resistance in some circumstances (e.g. may preclude use of PVC for permeate ports).

Use of a Wave Cyber pressure vessel for other than its intended application will void the warranty.

Wave Cyber will assist the purchaser in determining the suitability of the standard vessel for their specific operating conditions. For non-standard applications, alternate materials are available on special order. The final determination, however, including evaluation of the standard materials of construction for compatibility with the specific environment, is the responsibility of the purchaser.

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## **SECTION 3**

# **INSTALLATION**

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The following checks shall be made upon completion of system installation prior to operation:

1. Apply pads made of appropriate material (eg.: softwood or rubber) between the vessel and rigid saddles;
2. Expansion and contraction must take place freely after pressurizing the vessel  
– It is prohibited to use rigid clamp connection, including connection of permeate port with rigid clamp;
3. Do not use the vessel as any type of support, eg.: Hanging the multi path pipe on the permeate port;

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## SECTION 4

### OPEN THE VESSEL

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<b>Warning</b>
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Make sure to release the pressure in the vessel prior to the following operations:
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A. Cleaning impurities

Metal oxides and mineral deposits may cause decomposition of the vessel. Please remove impurities in compliance with the following procedures:

1. Remove impurities with a small brush or fine sanding paper;
2. Rinse away all loosened deposits using clean fresh water.

B. Removing the port.

Remove the port using the following procedures:

1. Remove the connection of piping and permeate port in the easiest access. Do not impose unnecessary load on the plastic permeate port thread to avoid failure in the plastic permeate port;

<b>Warning</b>
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Do not knock the joints to avoid damage of components.
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2. Remove the retaining plate screws using an inner hexagon spanner and then remove the retaining plate from the retaining plate groove;  
If it is hard to remove the retaining plate, try using some descaler (eg.: rust remover). Take care not to contaminate the vessel. Do not knock the vessel. Do not use any pry bar against the vessel to remove the port as this might cause delamination or cracks in the winding layer of the vessel.
3. After removing the retaining plate, check whether there is any protuberance on the port or the membrane path inside the vessel. Sand the vessel with 600 mesh sand paper the remove the impurity. Otherwise, port accessories or membrane may be damaged.
4. Connect a 200mm long pipe with male thread to the permeate port (with 1/2" female thread);
5. Grip the pipe and pull the head assembly out of the vessel. The port may need to be moved slightly up and down and left and right at the beginning. Make sure to disassemble with care.
6. Repeat the procedures above to remove the head assembly on the other end of the vessel;

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## SECTION 5

### REPLACE THE MEMBRANE

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The following procedures are for reference only. Please refer to the user's manual provided by the membrane supplier for the installation and disassembly methods of membrane.

A. Removing the membrane

1. Follow the procedures in section 4-“Open the vessel” to open the vessel;

<b>NOTE</b>
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The vessel is normally installed or disassembled in the direction of water.
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2. Remove the membrane from the vessel from the upstream end to the downstream end;

B. Installing the membrane

1. Make sure that the outside surface of the membrane and the inside surface of the vessel are clean and smooth. (See details in “Update the vessel”)
2. Reinstall the head assembly on the downstream end in accordance with the procedures in “Close the vessel”;
3. Lubricate the prepared membrane sealing elements with glycerin or a lubricant (a commercial lubricant that causes no contamination to membrane) recommended by the membrane supplier;

<b>WARNING</b>
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Never lubricate membrane seals with silicon based lubricant.
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4. Push the membrane with seals (U seal) into the vessel from the upstream end. Make sure that the opening of seals faces the upstream end;

<b>WARNING</b>
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Wrong installation direction of membrane may cause damage in the membrane element.
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5. Push the membrane with force until the membrane completely fits into the downstream permeate port. If there is difficulty in pushing the membrane, check whether the seals of the membrane are correctly installed. Make sure that the membrane is pushed into the vessel from the upstream end;
6. Upon completion of membrane installation, follow the procedures in “Close the vessel” to close the vessel;

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## SECTION 6

### CLOSE THE VESSEL

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Follow the procedures below to prepare for installation of the head assembly:

1. Repair or replace the head assembly (refer to “Update the accessories”). The O ring in the connection of permeate port and membrane must be replaced before installation every time;
2. Lubricate the big seal on the permeate port with the lubricant recommended by the membrane supplier;
3. Install the smaller O ring for permeate port and adaptor into the seal groove;
4. Install the head seal into the seal groove;
5. Install the threaded permeate port into the downstream end of the vessel. Hold both ends of the permeate port with two thumbs symmetrically and push the permeate port into the vessel until the retaining plate groove is exposed;

<b>WARNING</b>
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Never pressurize the vessel until the membrane is correctly installed.
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6. Install the membrane. Repeat procedure 6 to installed the upstream permeate port;
7. Clean the impurity on the thread of the permeate port with brush. Then apply seal adhesive or seal tape to the adaptor which is connected to the permeate port. After that, connect the adaptor to the permeate port. Tighten the thread manually. Screw the adaptor at most 1 1/4 more turns when it is tight. Otherwise, the thread might be damaged;
8. Repeat procedure 7 for the concentrate port adaptor;
9. Pressurize the vessel and check whether there is any leakage in the adaptor or the sealing position of the vessel. Release the pressure if there is any leakage. Tighten the adaptor if it is required. Then pressurize the vessel again and check whether there is still any leakage;

<b>WARNING</b>
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Make sure that no leakage exists as leakage accelerates corrosion in accessories and causes accidents.
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## SECTION 7

### ACCESSORY MAINTENANCE

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#### **Examining components**

**Plastic components:** Check whether any crack, dent or uneven color exists. These defects may be caused due to the chemical composition of the material. Please contact the supplier to confirm whether any other material is allowed.

**Metal components:** Check whether any corrosion, scrap, dent, crack or other damage exists, especially on the locking device, e.g.: baffle;

**Other components:** Check whether any damage that may affect the stress performance and sealing performance exists;

#### **Cleaning the vessel**

1. Remove the impurities inside the baffle groove with a brush or any other tool;
2. The first 100 mm of the vessel inside surface should be cleaned with a cloth and soap solution. Remove any contaminant or build-up;
3. Wash away the residue and soap solution inside the vessel with water;
4. Check whether there is any defect such as scrap, dent or leakage caused by damage in the sealing surface. If the leakage still exists after maintenance, the vessel must be replaced;

#### **Maintenance of other components**

1. Remove dirt on metal components with a hair brush;
2. Sand the surface of metal components with 200 mesh sand paper until dirt is removed;
3. Components must be rinsed with water and dried;
4. Follow the procedures above to check other components;

#### **Replacing components**

Any seriously damaged component must be replaced;

If any of above-mentioned defect exists, such component must be replaced;

<b>WARNING</b>
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Corrupted components may cause serious accident.
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All seals must be replaced before maintenance of vessel every time. The supplier provides all components.