

Visual Inspection

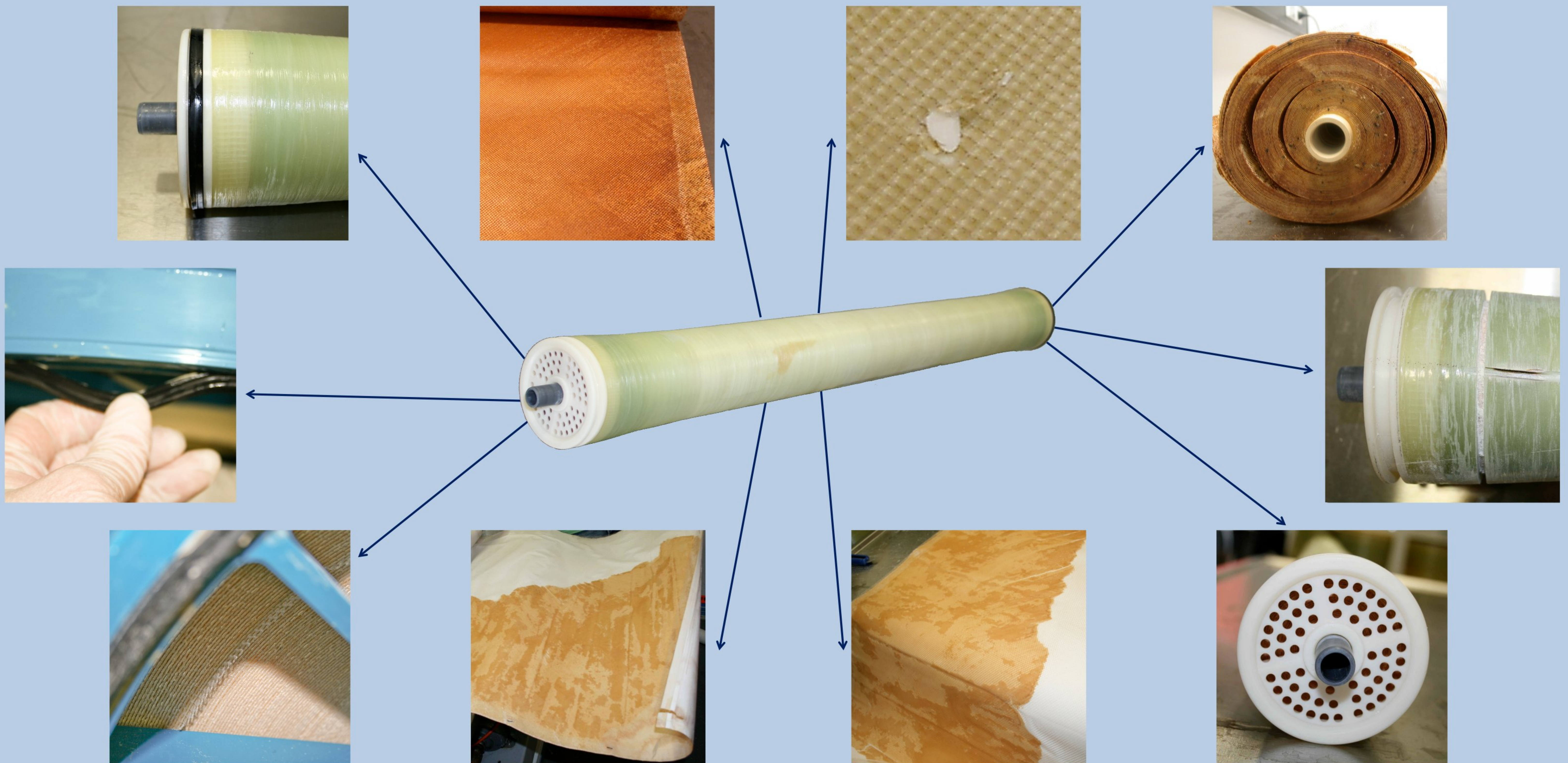
The visual inspection is the first step of any autopsy procedure. The aim of the inspection is to determine if there has been any physical damage to the membrane element (both internally and externally). The damage may be the result of operational problems, transportation,

maintenance or have occurred during the manufacturing processes.

The secondary purpose of the inspection process is to take samples of the membrane and the fouling materials so that they can be analysed with further tests. The inspection process is

destructive and the membrane elements are no longer suitable for use after the inspection has been conducted.

The figures below illustrate the inspection procedure and some typical problems and their location within the element.

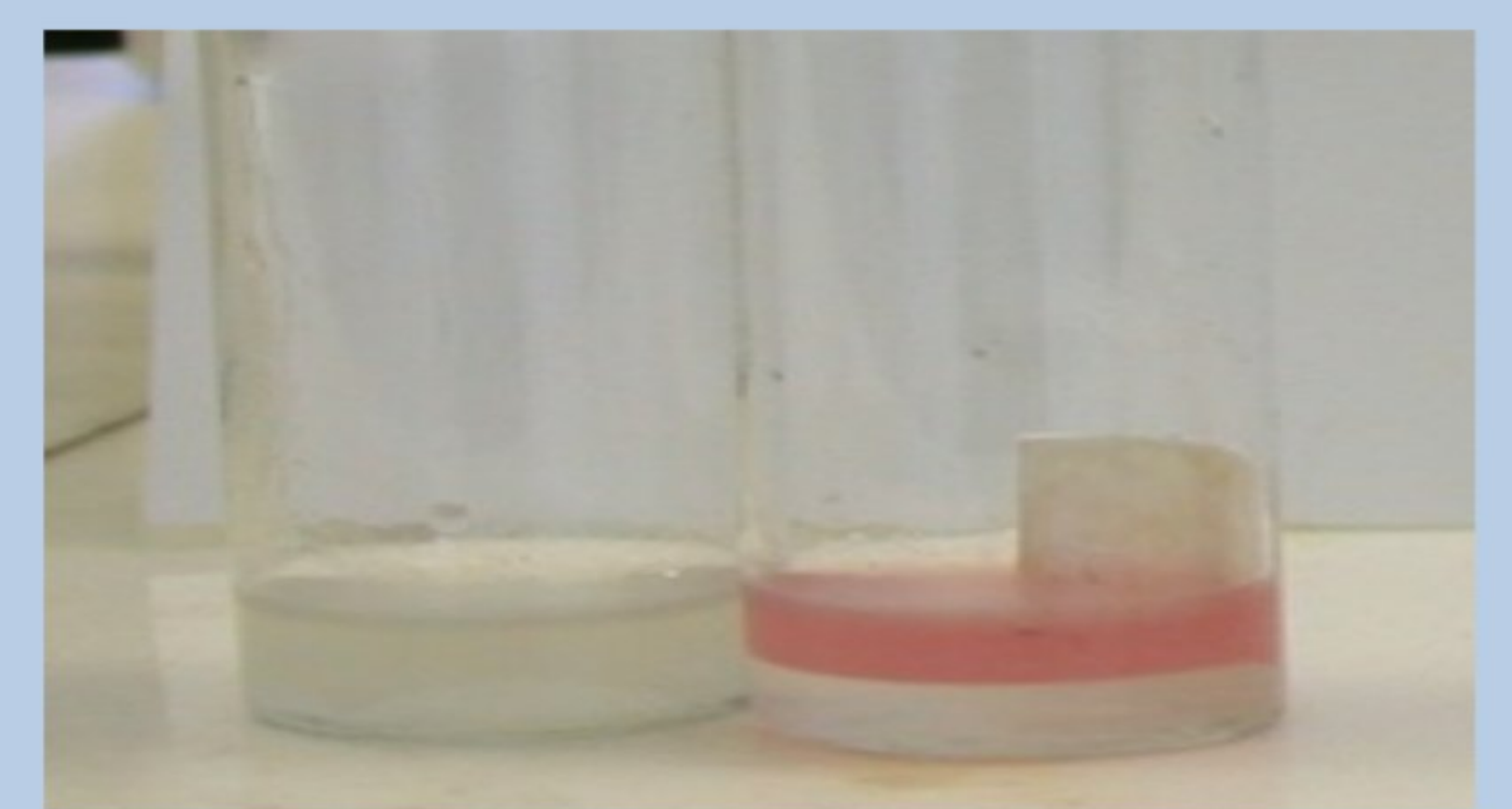


Oxidative Damage

The Fujiwara test is used to determine if the active layer of a thin-film composite polyamide membrane has been damaged by exposure to an oxidising halogen such as chlorine, bromine or iodine. This test is typically used to identify damage by free chlorine which is commonly used in pretreatment for prevention of biofouling or as part of the cleaning solution.

Oxidative damage to the membrane is most often indicated during operation by an unexpected increase in the permeate conductivity without substantial changes in the differential or transmembrane pressures.

Oxidative damage to the membrane is indicated by a colour change in the pyridine layer from clear to pink. See Figure on the right

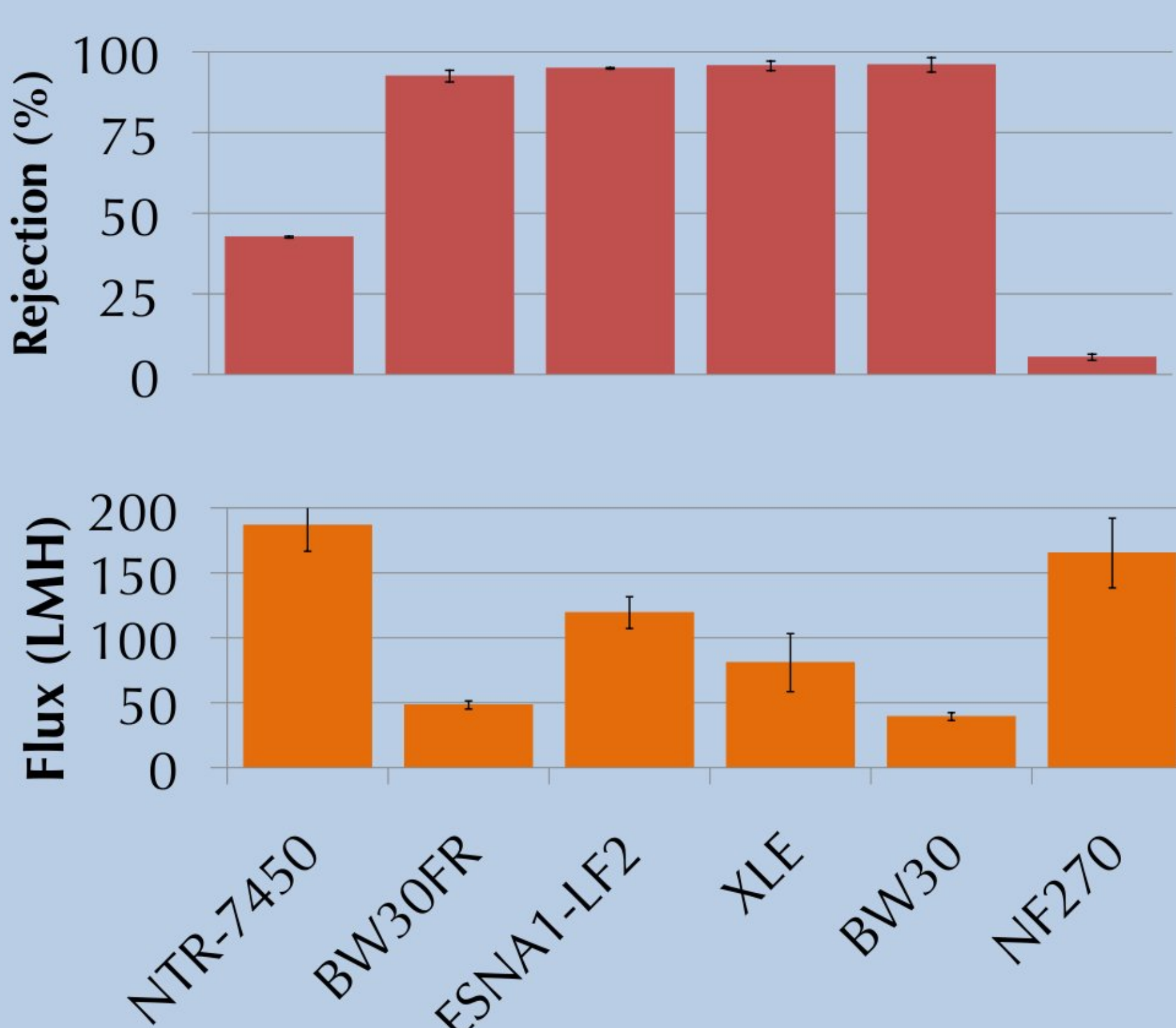


Fujiwara Test. Negative result on the left, positive on the right.

Wet Testing

Performance or wet testing can be conducted either non-destructively on the entire module, or destructively using a sample from the element in either a dead-end or cross-flow cell. The test

determines the performance of the membrane in terms of flux and salt rejection and should, where possible be compared to a fresh clean sample of membrane.



Experimental setup for wet testing and dye testing.

Dye Testing



Membrane damage illustrated using different colour dyes.

Dye testing is used to identify if and where the membrane has undergone physical damage such as delamination, tearing, puncture or abrasion.

The procedure may be undertaken at either full scale or bench scale in either a dead end or cross flow cell.

A non toxic dye is fed to the membrane. If there is no damage, the dye is predominately rejected and retained on the feed side. If significant damage has occurred, dye will pass through the active layer and absorb to the substrate of the TFC layer.