

# Whey & Milk Protein Concentration

Ultrafiltration is applied to either skim milk or whey to concentrate the dry matter to the required total solids (TS%). The commercially available powders' names are based on the protein type: milk protein (named casein) or whey protein. Their protein content (percentage of protein in the dry matter) ranges from 34-80% (e.g. Whey Protein Concentrate "WPC60" has 60% protein in the dry matter or Milk Protein Concentrate "MPC60" has 60% protein in the dry matter).

High-protein products such as Whey Protein Isolate "WPI90" (90% protein in the dry matter) may first undergo a microfiltration (MF) treatment step to lower the fat content. Ultrafiltration (UF) is then applied to the MF defatted whey protein permeate to standardize and increase the protein content in the total solids.

To maximize the solid content, it is common to use diafiltration (dilution with water) in later stages to wash more small non-protein components (i.e. lactose and ash) into the UF permeate. It is also common to increase the feed spacer size of the element to maximize the solid content during the later stages of the UF system. Additionally, a tighter UF membrane is commonly used for the concentration of products with 80% protein (or more) in the dry matter.

NADIR® UP010 is a 10,000 Daltons (Da) molecular weight cut-off polyethersulfone (PES) UF membrane developed for use in food & dairy applications. This membrane is commonly used for whey protein and milk protein concentration applications. Combined with our sanitary TurboClean® outer shell, these membranes are ideal for milk and whey protein concentration.

NADIR® UP005 has a nominal molecular weight cut-off of 5,000 Da. It is a PES membrane that is suited for process separations, particularly applications involving protein concentration to high solids levels (80% or more protein in the dry matter). In these applications, a tighter UF membrane like UP005 is often used to minimize protein losses, leading to maximized product yield. Combined with the TurboClean shell, MICRODYN-NADIR offers the best performing UF element for dairy processes. Please read [this case study](#) to learn more about TurboClean® UP005 elements.

## **TURBOCLEAN® EXTREME (XT) ELEMENTS FOR PROTEIN CONCENTRATION**

In places where chlorine use is restricted or undesirable due to concerns with chlorinated byproducts in wastewater streams, systems are cleaned using extreme conditions including alkaline cleaning solutions at high pH and high temperature. The elements in these systems must be able to withstand a cleaning pH range of 1-13 and cleaning temperatures up to 75°C (167°F) and must be heat-sanitizable at up to 85°C (185°F).

MICRODYN-NADIR offers TurboClean® Extreme Food & Dairy UP010XT and UP005XT elements primarily of polypropylene materials capable of tolerating these harsh conditions.

TurboClean® Extreme Food & Dairy UP010XT elements have a 10,000 Daltons (Da) molecular weight cut-off polyethersulfone (PES) UF membrane cast on a polypropylene support layer specifically developed for use in food & dairy applications where chlorine use is undesirable. This membrane is commonly used for whey protein and milk protein concentration applications. Combined with our sanitary TurboClean outer shell, these membranes are ideal for milk and whey protein concentration.

TurboClean® Extreme Food & Dairy UP005XT elements have a 5,000 Da molecular weight cut-off PES UF membrane cast on a polypropylene support layer. This membrane is suited for process separations, particularly applications involving protein concentration to high solids levels (80% or more protein in the dry matter). In these applications, a tighter UF membrane like UP005XT is often used to maximize product yield. Combined with the TurboClean shell, MICRODYN-NADIR offers the best performing UF element for dairy processes where chlorine use is restricted.

## TECHNICAL APPLICATIONS

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All the membrane products listed are available using feed spacers of various thicknesses to account for the total solids. For more information or questions, please contact MICRODYN-NADIR.

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