

CASE HISTORY

MELNESS WATER TREATMENT WORKS

End User	Scottish Water
Process	Ultrafiltration
Application	Removing colour for potable water supply



Introduction

The Melness Water Treatment Works treats the raw water supply from the Loch na h-Uamhachd reservoir to provide drinking quality water for public consumption in the Melness locality. The treatment of the peaty raw water is undertaken using a crossflow membrane filtration process utilising ceramic ultrafiltration membrane elements. Granular activated carbon filters, a limestone contactor and a residual chlorine dosing provide secondary treatment. A treated water tank provides the required chlorine contact time before a booster set pumps the treated water up to the reservoir, ready for delivery to the supply. The plant production rate is up to 110m³ of treated water per day.

Description

The following provides a description of the various process stages:-

Raw Water Inlet

The Plant receives untreated raw water from the Loch na h-Uamhachd supply at 14 Bar pressure. This pressure is reduced and controlled to 8.5 Bar.

Self Cleaning Filter

Raw water passes to a filter with a mesh size of 200 microns. The raw water passes through the filter and the coarse contaminants are removed. A wiper unit within the filter element cleans the filter surface.

Basket Strainer

When the filter is off-line for maintenance a basket strainer is used to ensure that production is not disrupted. The water then enters the membrane crossflow filtration circuit.

Membrane Circuit Operation

Once the membrane loop is full of water, the main pumps start to recirculate the untreated water around the loop. The water passed through the axial channels of two Kerasep K99BT crossflow filtration modules in series. These modules each contain 99 cylindrical porous ceramic crossflow filter elements and through each there are 27 axial channels, the surface of each channel being coated with a layer of zirconia that provides the active membrane filtration. The available raw water pressure is used to drive the membrane filtration process. The pressure in the circuit causes clean water (permeate) to pass through the membrane layer into the shell side of the modules and on for further treatment.

Carbon Filters

Filtered water from the modules combine and flow forward through the GAC filters. The filters are filled with activated carbon granules which provide polishing of any residual organics in the filtered water.

Limestone Contactor

From the GAC filters, the treated water flows forward into the Limestone Contactor which contains limestone granules. The granules provide a means of elevating the pH and the alkalinity of the treated water.

Chlorination

Following the Limestone Contactor, Sodium Hypochlorite is injected into the treated water under residual chlorine control.

Treated Water Tank

The treated water tank also serves as a chlorine contact tank to ensure that the water leaving the treatment building can *immediately* be supplied to customers. The treated water is pumped to customers and to the reservoir tank.

Treated Water Delivery and Plant Operation

Booster pumps transfer water from the Break Tank to the Portvasgo Reservoir Tank. A small quantity of the supply is piped direct to Strath Melness South.

Wastes

The retentate, a concentrate of the raw water, is discharged directly to drain. Chemical wastes from the membrane cleaning operation are pumped into a Wastewater Holding Tank where they are manually sampled, treated, re-sampled and then released to drain.

The plant is designed to meet the following criteria:

Parameter	units	Inlet	Outlet (95%ile)
Colour	Hazen	221	True, <10
Turbidity	FTU		1
Iron (total)	mg/l	1.4	0.1
Manganese	mg/l	0.02	0.03
E. coli		present	zero
pH		-	7.8—9.2

Advantages of a ceramic membrane:

- Significantly longer working life than organic membranes
- Higher permeate flux
- High resistance to sudden mechanical, chemical and thermal failure, unlike organic membranes
- Tolerant of aggressive cleaning procedures
- One step process without the need to pre-treat