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IMechE West Cumbria eNewsletter
Edition 93, April 2011

Institution of MECHANICAL ENGINEERS

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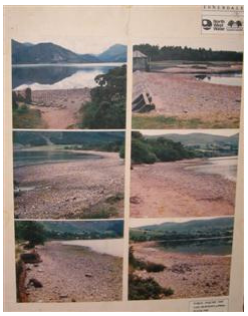
Ennerdale Water Treatment Works Visit on 28th April 2011

A very unique insight into how water comes from Ennerdale to our taps! Ennerdale Water provides up to 68 million litres of water per day to a population of approximately 80,000 in Whitehaven and villages in the surrounding area of Copeland.



Photo's of the drought in 1987.
The lake was down by 890 mm!
Hence followed by a public enquiry in 1988 into ways To alleviate the problem.

Photo 1 top right shows the old pump house and weir

Photo 1

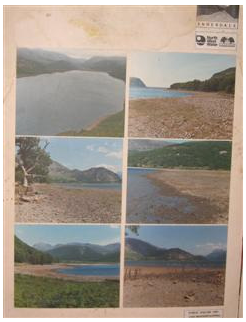


photo 2

Construction of tunnels, 800 metres long. Using boring machinery to avoid damaging the natural vegetation.

Copper dam under construction ¼ mile out in 5m of water.

Shaft to link tunnels to Lake and plant.

Tunnel to copper dam and treatment plant

The new works became operational in April 1994, a modern and fully automated treatment works replacing an older site near to the lake shore, (photo 1).

The treatment process:-

First stage – Microstrainer Process.

Raw water is strained through three conventional, rotating drum microstrainers, which remove all solids greater than 30 microns. The microstrainers are continuously backwashed and effluent washwater is pumped to the river Ehen. Additional compensation pumps ensure that a minimum flow is maintained in the river Ehen at all times. Strained water is dosed with chlorine (sodium hypochlorite) for disinfection, fluoride (hexafluorosilicic acid) for dental health, caustic (sodium hydroxide) for pH elevation and phosphate (phosphoric acid) to reduce plumbosolvency.

Main pumps and Compensation pumps (Orange top left)

First stage:- Micro straining drums

Second Stage – Microfiltration Process. (Commissioned in 2000)

There is a risk that Ennerdale water may, at times, contain the micro-organism cryptosporidium parvum. This micro-organism is resistant to traditional disinfectants and can cause gastric illness if ingested. The membrane plant filters water to sub-micron level and hence provides a barrier to cryptosporidium.
The microfiltration plant consists of a number of primary membrane filters, which are backwashed frequently, and a number of secondary membrane filters, which treat the backwash effluent from the primary filters. Periodically the filters are chemically cleaned with solutions of sodium hydroxide, sulphuric acid and hydrogen peroxide.

Strained water from the existing process is intercepted before it is dosed with chemicals and pumped through the microfiltration process before returning to the contact tank feed pipe for chemical treatment.
Bulk supplies of sodium hydroxide are transferred to the membrane plant from the chemical building. PACI and sulphuric acid stock tanks are located in the membrane building.

There is neither a watercourse, suitable for discharge of “un-natural” wastes, nor a sewer local to the site. All wastes therefore have to be removed from site by a road tanker. The membrane plant produces large amounts of dilute effluent. A waste treatment plant is provided to recover as much water from the effluent as possible, by chemical coagulation and gravity thickening, for recycling to the membrane plant.

Residual sludge is stored on site until it can removed by tanker. Chemical wastes on site are collected in the chemical waste tank located in the courtyard.

one of the continuous micro filtration units (CMF) which filters water down to **0.2 microns**

19 CMF units

Each unit will filter around 125m3/hr, and perform a compressed air backwash every 60 minutes. The units will also do a clean in place (CIP) using a 2% solution of sodium hydroxide every 14 days, and a (CIP) uses hydrogen peroxide, but this is only used very rarely.

Visit Organiser Ian Lupton