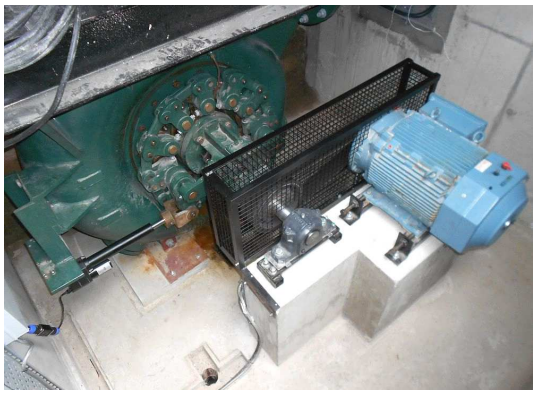
HYDROPOWER RETURNS TO CROMFORD MILLS

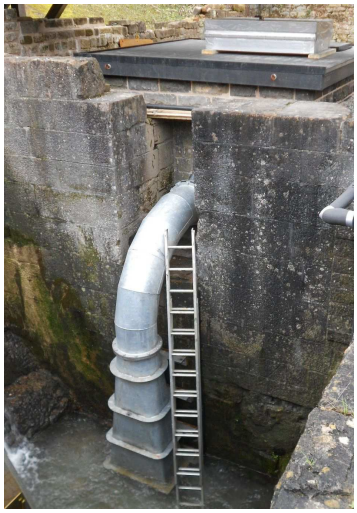
Cromford Mill in Derbyshire is a Grade I listed cotton mill, famous for establishing the first water-powered factory system in 1771. The Arkwright Society commissioned a refurbished turbine and new waterwheel to be installed in 2023, to exploit the power available at the historic wheelpit, where Bonsall Brook cascades over a fall of 6.5m.

The highly constrained layout within such an important heritage site, plus the EA requirement for 6mm screening, posed a number of challenges to Derwent Hydro Developments, the lead designer. The choice of a 1950s spiral-case Gilkes Francis turbine, refurbished and installed by DHPL, allowed the turbine and generator to be almost entirely hidden below ground, with only the draft tube visible within the wheelpit.

To avoid a mechanical screen-cleaner, an overwash intake was implemented as an effective, low maintenance 6mm screen, although sacrificing 0.4m of head. The system also includes a water-sourced heatpump, supplied by Vaillant, with 2 vertical heat-exchangers in the corner of the wheelpit, fed from the turbine forebay tank.

The turbine is capable of 14.5kW, with all the power absorbed into the network of the Mill. The 38kW of heat will be used within an adjacent building, where a new cafe is planned.





To demonstrate the original technology on which Cromford Mill was founded, a 5m-diameter waterwheel was installed on the opposite side of the wheelpit. Rotating at a majestic 8 revs/min, the overshot wheel can produce up to 1.5kW via a gearbox, belt-drive and permanent-magnet variable-speed AC generator. The wheel was manufactured by 2V Micro-systems as a light-weight construction in zinc-plated steel. The wheel layout is unusual because the shaft is overhung from a pair of bearings on the same side of the wheel, rather than a bearing on each side. This allows the whole wheel to be fully visible from the visitor gantry.