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Quarry control helps maintain river levels

ABB drives, controlled by an ultrasonic level controller, are helping maintain the water levels in the Mells River in Somerset. The equipment is used by Hanson Aggregates to pump water from its limestone quarry near Frome, Somerset, producing three million tonnes a year from work levels up to 90 metres below the water table.

The water was previously pumped to a discharge channel. As part of its planning permission to extend the quarry, Hanson Aggregates proposed using the water to augment river levels and maintain the region's ecological balance, particularly during dry periods. To ensure the scheme's success, a sump was built in the quarry floor, creating a seven-metre deep reservoir.

The Whately Pumping Scheme relies on a 355 kW pump to augment the river and two 250 kW levelling pumps. In addition to augmenting river levels, the reservoir is also used to provide high-pressure water from a 55 kW pump that is primarily used for washing stone in the quarry.

To control the pumps, Hanson Aggregates worked closely with ABB's local distributor, South West Industrial Drive Centre (SWIDC), to find a solution. Because the pumps are on a level in the quarry some 30 m below the surrounding land, SWIDC decided to fit four variable speed drives in a 32-foot container, which could be lowered down as a unit.

A 55 kW drive is used to control the high-pressure pump while three larger drives are used for the augmentation and levelling pumps. The container was fully outfitted and tested outside of the quarry and then lowered by crane in a single lift to the pump flat.

The container is cooled separately since it is exposed to direct sunlight and the four drives generate heat inside the container.

SWIDC supplied an ABB ultrasonic level controller to sense the reservoir water level and the augmentation water is tested for turbidity using an ABB controller. If turbidity exceeds the agreed minimum, a proportional-and-integral (PI) controller operated by the 355 kW drive automatically stops the pumps for 30 minutes to allow the water to settle. Two ABB flow meters monitor the exact flow rates of water.

Similarly, if the water level in the reservoir exceeds 7.2 m, the two PI-controlled 250 kW levelling pumps are used to maintain the level. These pumps operate in cascade with one pump starting initially. In most cases, the first pump has sufficient capacity to handle any excess water.

However, if the water level continues to rise, the 250 kW drive reduces the first pump to 80 per cent output before starting the second pump. It then increases the speed of both pumps in tandem to control the water level. The water is discharged through a common main into the river.
The ABB drives are programmed to stop all pumping if the reservoir level falls below 6 m.

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Caption: Hanson Aggregates is managing water levels at its quarry near Frome, Somerset, using drives and instrmentation from ABB. Excess water is used to augment river levels in the area.

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