

CHEMICALS CASE STUDY - TERRA (NITROGEN) UK LTD, BRISTOL, UK.

## Repair strategy for fertilizer prill tower



Making good chemical damage to a structure while still in operation.

In its manufacture, the agricultural fertilizer ammonium nitrate is pelletized by spraying the product in liquid form from the top of a concrete tower. As the liquid droplets fall and dry, they form pellets or prills.

Ammonium nitrate is very aggressive to reinforced concrete. This 100m high tower at Bristol, built in 1964, had suffered deterioration in its top-of-tower plant room which threatened future operation.

Plant shut-down would have incurred significant daily costs and was not an option. Repairs, therefore, would have to be undertaken with the tower on line. Major repair work at up to 100m above an operating chemical plant was recognised as a significant hazard.

### **Solution**

We have detailed knowledge and understanding of deterioration mechanisms and the appropriate repair techniques. And having carried out annual maintenance on the tower for a considerable period already, we know it well.

We developed a long-term solution with the contractors who undertook the reconstruction work. ABB carried out a visual survey, subsequently specifying a detailed intrusive survey that the contractors carried out. Additionally, one of our project partners conducted a finite element analysis to establish the structure's real behaviour.

From the results, we prepared the scope of work, design and detailed specification for the required construction work. We identified suitable resource and specified what needed to be done. We managed this work and were on hand to assist and make any changes when variations on the original plans were needed.



For the plant room's reconstruction, the following elements and procedures were used:

- Significant temporary supports
- Extensive replacement of deteriorated concrete
- A novel method of on-line reconstruction of the main tower walls
- The use of microsilica concrete for an increased resistance to chemical attack and high early strength
- Spray-applied concrete

#### Benefits

- Terra were able to avoid costly extended plant shut-downs and associated loss of production
- Extended economic design life
- Improved confidence in the prill tower's condition and resultant safety
- Reduced future maintenance expenditure
- A greater understanding of the tower's structural behaviour, which will be invaluable for repairs in other parts of it

