**Essential Expertise in Wastewater Treatment Delivers Major Environmental and Cost Performance Improvements at a Food Production Plant in Europe**

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<th>ENVIRONMENTAL INDICATORS</th>
<th>ECONOMIC RESULTS</th>
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<td>Reduction in sludge volume for disposal from 19,000 tonnes per year down to 11,000 tonnes (42%)</td>
<td>Reduction in sludge disposal costs of &gt; €105,000 (42%) per year, and also the associated trucking operations and emissions</td>
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<tr>
<td>Reduction in commodity and other treatment consumables by 1,175 tonnes per year (78%)</td>
<td>Reduction in cost of treatment consumables by €205,000 (55%) per year, and also the associated deliveries, emissions, and risk</td>
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<td>All data verified by the customer</td>
<td>Overall reduction in the Total Cost of Operation (TCO) of over €310,000 (50%) per year</td>
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**Introduction**

A family-owned company operates two processing plants for gourmet foods, located close together in the north of Europe. Management at the company are very focused on staff safety, minimisation of resource use, and overall production cost-efficiency. To assure this, the company expects the best on-site expertise from its supplier partners, innovation in new technologies, and improved sustainability performance through better water, energy, and waste management. In particular, management are always looking for new ways to improve the cost-efficiency of its waste treatment operations. The company strives to ensure that its manufacturing operations are compliant with its Environmental Management System. In addition to these sustainability commitments, tightening local legislation and environmental standards put increasing pressure on all such manufacturing companies to lower their consumption of natural resources, and to reduce associated emissions and waste. Commercial pressures are ever present and continue to drive reductions in cost.

**Background**

The company operates two production facilities close to each other, producing salads and a range of other speciality foods. There is a single centralised wastewater treatment plant at one site: the wastewater from the other site is brought in by a continuous trucking operation. Over the past few years production volume has grown, and it has become increasingly evident that the capacity and performance limitations of the wastewater treatment plant were creating a bottleneck, and also a barrier to any future expansion of the food production operation. Historically, the amount of wastewater treated was close to 400 m³ per day, but this had been steadily increasing year on year. As a result of a planned expansion programme over the next five years, wastewater volumes were now expected to increase to around 800 m³ per day, an increase of up to 100%. This was of concern to management on site, as the current configuration and performance of the plant had already for many years consistently failed to meet the standards in place for the level of Chemical Oxygen Demand (COD) allowed in the final effluent by the local authorities.
Effluent from the plant was discharged into the local river, and samples taken had regularly shown COD levels greater than the maximum permitted level of 100 ppm. In fact the company had been prosecuted for this by the local authority on at least one occasion, and had to pay a large fine. During restorative work, the company had been forced to shut the waste plant down, and use trucks to take wastewater away for off-site disposal at greatly increased cost.

**Current Situation**

The wastewater plant consists of a series of buffer-tanks which receive the incoming effluent, a fine screen, two Dissolved Air Flotation (DAF) units, an equalisation tank, aerobic biological treatment, and a secondary DAF unit, from where the outfall is discharged to river. Particular difficulties were being experienced with maintaining consistent COD removal in the biological plant, and also a stable level of Mixed Liquor Suspended Solids (MLSS). MLSS levels were generally <1000 mg/l whereas a minimum level of 2000-3000 mg/l would be needed for optimal operation.

The plant was being treated by a competitor of Nalco, and also at times a consultant was brought in to advise on how to improve treatment performance. In terms of the treatment programme in place, this included the addition of over 900 tonnes of iron-based commodity coagulant per year, and over 600 tonnes of caustic soda. There was also a polymer flocculant overlay. Due to the high dosage of iron salts, conductivity levels remained high throughout the system, often up to 8000 µS. This high conductivity, constantly-changing incoming wastewater quality, and the poor performance of the biological process, combined to give treatment instability, out-of-specification final effluent quality, and a very high Total Cost of Operation (TCO). Overall treatment costs were significant, running at >€600,000 per year. Treated sludge was sent to an off-site biogas plant, and thus has to be of a specific quality.

**What were the customer’s goals?**

Key Performance Indicators (KPIs) for the customer included:

- Ensure safe, reliable operations, especially during periods of peak production
- Ensure a final effluent quality in compliance with the legal standards
- Optimise DAF, biological plant, and clarification performance
- Reduce the Total Cost of Operation
- Improve sustainability performance
- Deploy necessary systems and support to assure consistent operations
- The ability to treat the additional volume and load expected from plant expansion

In the absence of the necessary support from the current supplier, management at the company, working with a local engineering company, invited Nalco to identify areas where improvement could be made to bring the total system into compliance with operating and legal discharge standards, and at the same time reduce overall costs.

**Actions Taken**

A Team of Nalco wastewater experts immediately came to the plant to perform a stepwise approach to assess the current performance of the total plant, a root cause analysis to identify the problems, and to deliver the necessary action plan to put things right. The Nalco Team reviewed all aspects of treatment plant operation, especially the DAF units, biological plant, and secondary DAF unit, to identify areas for improvement which would positively impact upon the customer’s stated KPIs. Major initial opportunities to rapidly-improve system operation were identified at the two main DAF units. Staff from Nalco brought pilot DAF units to site to evaluate programme options, and identified a new treatment regime. Following this, Nalco was also to extend this evaluation to all other parts of the plant. Ultimately a complete programme was proposed to the customer, and this was evaluated and accepted by an outside university and by an engineering consultant brought in by the company.
The proposal was accepted by the customer, and Nalco staff then carried out a sequence of staged full-scale trials on the actual plant over the following three months. The action plan included application of both new innovative chemistry, on-site expertise gathered from the treatment of many similar plants elsewhere, and engineering changes to different parts of the plant. Nalco was able to eliminate entirely the use of the iron salts on the plant, and also reduce the amount of caustic soda required. After one month of full-scale trial work, the plant was operating at required performance levels. As a result of this success, Nalco was asked to implement the new regime on a full-time basis.

Results

Using the new Nalco treatment regime, this new Nalco customer has been able to confirm that the level of COD in the final effluent is now below 100ppm at all times, and there have been no further fines from the authorities or any plant shutdowns related to poor effluent quality. Elimination of iron salts has directly reduced the conductivity of wastewater on the plant, and also in the final effluent. This also very clearly improved the performance of the biological plant. The MLSS level in the biological treatment plant is now maintained at the desired level of up to 3000mg/l, directly and positively impacting the achievement of in-specification levels of COD. This now enables the plant to treat higher wastewater volumes whilst still meeting discharge limits.

In terms of sludge production, the elimination of iron salts, and the use of the new Nalco programme overlay, have reduced the volume of sludge taken off-site to the biogas plant by 8,000 tonnes per year, saving over €105,000 (42%) per year. The biogas company has confirmed that the change has enhanced the sludge quality and biogas productivity.

The elimination of iron salts and a large proportion of the requirement for caustic soda has contributed to a reduction of 1,175 tonnes of treatment consumables (78%) per year, equivalent to an annual saving of over €205,000 per year. Overall, the use of the new Nalco programme has delivered a reduction in excess of €310,000 per year in the Total Cost of Operation at the plant.

Conclusion

By using the proven problem-solving approach, coupled with knowledge and experience gained from the treatment of hundreds of wastewater plants around the world, Nalco was able to support a significant improvement in the reliability of wastewater treatment plant operations for this new customer. This has delivered improved sustainability performance by meeting environmental standards required, and protection for the local river and its ecology. The combination of Nalco problem-solving, on-site expertise, and the application of the new innovative technology and treatment strategy, assured improvements in sustainability performance and production continuity.

Nalco staff are now seen as the on-site experts by the customer, and partners in delivering upon current KPIs, and in preparing the plant for future expansion. The customer is now looking to build a completely new wastewater treatment plant nearby, and has enlisted the help of the Nalco experts in the development of the plans for this new additional expansion project.