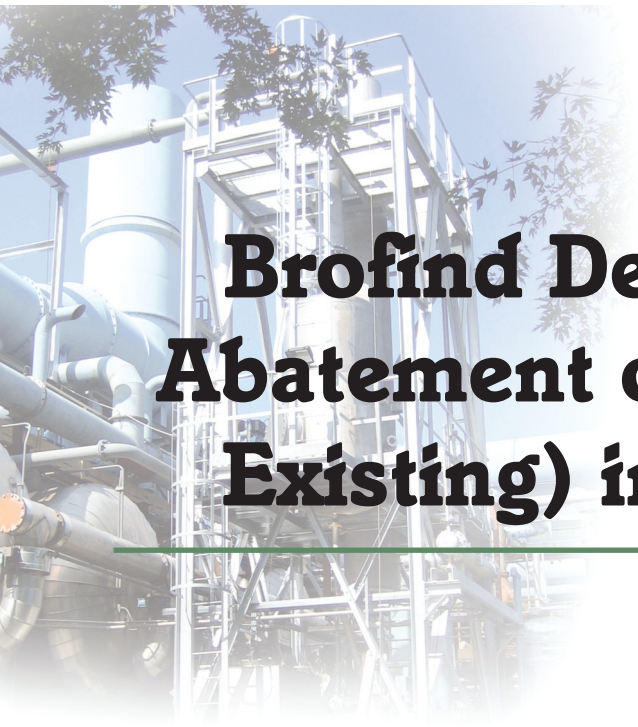

# Brofind Demonstrate How to Turn your VOC Abatement or Solvent Recovery Plant (New or Existing) into a Never-Ending Energy Source

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***Before the increase in Global ecological consciousness, air treatment plants were only required to comply with the norms set out for emissions from the stack.***

Then came the problem of increasing production costs and further expenses connected to the operation and management of the treatment plants themselves. The main "players" in the market undertook to optimize existing abatement and recovery technologies in an effort to limit their capital and operating costs.

In the last twenty years, starting with catalytic combustion plant, followed by the introduction of regenerative thermal oxidation, alongside the use of special ceramic material for heat recovery and the introduction of new pollutant recovery processes, (each including the possibility of installing upstream concentration plants), operating efficiencies have improved. In fact, a large part of the market has achieved so-called "self-supporting" or, "autothermal" operation.

A self-supporting plant actually means that:

- In the case of thermal treatment, the pollutant (VOC) is the only or, at least the main source of energy used by the system to support the purification process.
- In the case of recovery, the pollutant, being reused in the production process, leads to a reduction in the cost of new solvent, which can cover the full cost of purification and creates a positive pay-back on the investment.

Until recently, these conditions were considered acceptable, but today's market is more demanding. The global need to reduce $CO_2$ emissions, the increase in energy costs, the search for independence from traditional fuel sources, are forcing companies to analyse their production processes in order to optimize both the environmental impact and production costs.

In the last few years Brofind have carried out research and development projects, in cooperation with some customers, with the aim of combining the ecological problems with those of minimising energy consumption and production requirements.

Despite the quality, age and type of purification plant, Brofind have undertaken a number of projects in order to achieve these objectives. The following are typical examples:-

***Closed Loop***

In many cases the outlet air at the stack of the purification plant still contains some useful heat, which is too low for further indirect recovery, but may be perfect for a direct process. It is possible that some departments or, areas on a production line need hot air for drying, post treatment, etc. The air can be taken directly from the stack and mixed with ambient air in a special "mixing chamber", in order to obtain perfect operational conditions. Obviously, such an advantageous solution has to be studied carefully because the air that could be recycled from the stack will still contain some pollutant, albeit an almost insignificant amount. For this reason it is better to limit its use to production areas or processes which do not require the physical presence of an operator. In some cases, (as in the adhesive tape manufacturing industry), it was possible to recycle 100% of the treated air in the production process. The environmental impact was cut to a minimum (practically no emissions) and the operating costs were considerably reduced (the payback of such a system can be less than one year).

***Cooling***

Although it sounds like an oxymoron, it is possible to achieve cooling using the heat obtained after a purification process. Experience has taught us that plants with lithium salts which, using hot water, steam or hot air directly from the purification plant, can store calories and turn this energy into chilled water at 7 °C.

This application is suitable on recuperative thermal combustion processes, because the temperature of the purified air at the stack is around 400 °C, which leads to a better efficiency and faster return on investment. On a medium/small-sized plant of 25.000 $Nm^3/h$, for example, it is possible to produce approximately 1.000 kWh of chilled water.

***Thermal Oil Heating***

On certain production processes thermal oil is used as a means of heating. In some cases, we studied the process and then agreed with the customer about the possibility of replacing the existing heating system, (i.e. direct or indirect burners), with a new thermal oil circuit, the greater versatility of which creates considerable energy savings and also better process temperature control. For this reason, it obviously becomes interesting to recover a certain quantity of heat in order to heat up the oil circuit.

In the past, the main difficulty for this form of heat recovery was connected to the temperature of the outlet gas from the purification plant. As this value is commonly lower than that at which the oil is used (240-300°C), it was necessary to study and test a heat recovery system based on extraction of excess heat directly from the hottest area of the purification plant (i.e. the combustion chamber), and not exclusively from the stack. A special refractory butterfly valve allows air to be extracted at 800-900°C and to regulate the amount of recovery according to the heat available in the purification plant and to suit the requirements of the production process.

It is also possible to provide a heat recovery system with a direct thermal oil heater designed to meet production demands, even with no pollutants in the purification plant, (e.g. during start up). With this solution, it is possible to eliminate the auxiliary oil heater and to combine this function with the purification plant.

***Steam Recovery***

This process is particularly suited to solvent recovery plants with activated carbon and steam regeneration.

Brofind have optimised such a process in order to minimize the consumption of steam during carbon regeneration, with the result of accelerating the pay back of the plant. We have done this by developing a recovery process based on the enthalpy of the used steam.

The heat remaining in the desorbate, coming out of the carbon filters during regeneration, is recovered by heating water and, by means of a special Venturi ejector fed with steam to produce approx. 30% of the necessary steam at no additional cost. Based on typical calculations, this type of plant has a pay back of less than one year and also results in a large reduction in the production of $CO_2$.

***Steam Production***

In cases where steam recovery is not possible, e.g. because of the high acidity of the combustion gases from the destruction of chlorinated or brominated organic compounds, Brofind have installed a fire tube boiler for the production of steam. This technology is able to work, (due to the water evaporation temperature and the operating pressure), where these acids are not aggressive, thus obtaining steam at a medium pressure in complete safety. In some cases the steam, in addition to being recycled in production, is used to preheat the combustion gases. Gas cooling in the boiler makes any further post-treatment phase (quench-+scrubber) far easier and less expensive.