

Revamping - evolving from the petrochemical

ITAS has accumulated a considerable experience throughout the years about the behaviour of heat in tunnels of rotary presses where solvents are used, as well as about other types of dryers. This knowledge has allowed ITAS to successfully optimise older machines (as newer units are already equipped with the required recirculation systems and therefore do not necessitate revamping) bringing emissions to the lowest possible levels and to the highest concentrations. These are the ideal conditions to minimize the investment on a treatment system (by oxidation or wet removal), because it will be working on smaller volumes and



The picture above gives an idea of the impressive size of the post-combustion unit, and not surprisingly since it is the largest of its kind installed in Europe, with a nominal capacity of 250,000 Nm³/h, increasable to 275,000 Nm³/h. It allows also the production of 12 tonnes per hour of steam at 9 bar using the solvents' enthalpic energy and manages 38 ink laying machines, handling them independently from each other.

will recover a larger amount of solvents when it is economically convenient to do so. In the case of La Chevrolière, where an oxidising unit was used, this technology has allowed, for concentrations above the thermal plant self-supporting limit, to implement also the production of steam as an added feature and bonus payback on the investment.

ITAS revamping solutions are based on the company's consolidated knowledge and experience about drying processes, with special care given to high speeds and particular conditions of concentration. ITAS answers focus on recirculation, controls on individual elements and optimisation of ventilation and extraction and are finalised to the treatment of small volumes and high concentrations. All this in the absence of smells and solvents in the workplace.

SPECIAL CARE WAS GIVEN TO SAFETY MEASURES DESIGNED TO ENSURE PERSONNEL SAFETY AND PRESERVE THE ENVIRONMENT

Strong Points

The technological breakthroughs of this post-combustion unit are highlighted by the operating tests performed, beginning with emissions (COV, NOx, CO, methane), that resulted much lower than the minimum levels required by existing legislation (see enclosed chart). Another notable feature is the low consumption of electricity achieved thanks to ITAS know-how on thermal oxidisers (the first was installed in 1976) and the use of valves, developed in-house, with a mechanical and pneumatic double seal which guarantees the 100% closure of the valve. Great care is also given to the ductings' cross-section design and inlets into the chambers, the latter developed to have very low load losses to the benefit of energy requirements.

The type of ceramic charge used was adopted after considerable performance evaluation tests in order to guarantee maximum thermal efficiency alongside very low load losses. Another strong point is the care given to details such as the treatment of all structures with paints of the appropriate type and thickness and the enactment of safety measures to safeguard personnel and installation. Worthy of notice is also the advanced man-machine interface (adopted also in the aircraft industry) which allows the unit's operation to be monitored continuously and gives different warnings – graphically too – of components requiring maintenance. A permanent modem connection to ITAS headquarters is assured 24h/7/365 as well as to individual ITAS technicians, equipped, when travelling, with laptop computers so that



Diagram of the recovery boiler. The chart below shows data on flow rate, pressure, steam generation and outlet temperatures.

the customer may receive instant assistance at all times. The software was developed by ITAS: the open connection to the plant enables ITAS to update it directly when/how the need arises.

OPERATING DATA CHECKED				
	NO _x mg/Nm ³	CO mg/Nm ³	VOC mg/Nm ³	CH ₄ mg/Nm ³
Minimum	0,0	0,0	0,0	0,0
Average	0,3	16,4	1,4	0,0
Manufacturer's guarantee	50	50	20	15
Local authority limits	50	50	20	50
Power consumption	declared	checked	difference %	
kW power	546	340	38	
kW gas	0	0		



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Under the banner of recycling

CASE HISTORY



View of the Rigetherm® post-combustion unit (with the steam boiler's recovery system), soundproofed cabin, control station and process fan.

The case history examined here covers the exploitation of enthalpic energy of solvents to produce steam. It goes without saying that ecology solutions should also be concerned with the return on the investment made on environment protection. A typical instance in this respect is the installation by ITAS of an imposing post-combustion unit at a large plant in France.

Of fundamental importance in the process is the uniform thickness of the ink coating because the jumbo roll will later be cut into ribbons, each of which must possess the same technical characteristics. The machines used for producing the jumbo roll have the appearance of a set of gigantic rolls onto which the jumbo roll is wound and unwound at each manufacturing stage.

When we look at thermal transfer printing ribbons, Armor's La Chevrolière plant is the largest production facility in Europe. Its 300-strong workforce handles 15 tonnes per day of ink to produce 150 jumbo rolls and 48,000 TTRs. In practice this means that half the ribbons produced in the old continent are manufactured by this important multinational organisation in an integral cycle, which includes ink manufacture, laying the ink on the roll and final cutting into ribbons. The thermal transfer ribbon is originally a 4.5 micron PET film onto which are deposited a back coating layer on one

side and the thermal transfer ink on the other. Two manufacturing processes are used: one is the Solvent Base for resin and resin-wax base ribbons, the other is the Hot Melt for wax-only base ribbons. Despite being different processes, they have some characteristics in common: the starting point is for both the jumbo roll and the base material is the same type of PET. One side is initially back coated and assumes the typical bright surface finish: this will be the ribbon's back. Subsequently, the ink is applied to the other side in one to three layers, each followed by oven drying.

THE REGENERATIVE THERMAL POST-COMBUSTION UNIT OPERATES ON THE HEAT ABSORPTION AND RELEASE PRINCIPLE OF A CERAMIC MASS HOUSED IN SEVEN TOWERS

Care for the environment

The plant at La Chevrolière boasts an important achievement in the safeguard of the environment. On this site, we can find one of the largest solvent incinerators in Europe, capable of processing 250,000 Nm³/h, which required an investment of € 3.5 millions, not so surprising when we consider Armor's unheeding policy of maximum environ-

mental protection. All printing ribbons produced here are accompanied by a safety card, made available to end users, conforming to European Union directives (98/73/CE e 67/548/CE). All thermal transfer ribbons produced by Armor in France conform to European Union Directives, are non-flammable and free from danger-

ous substances. Ribbons and packages follow the EU 94/62/CE directive on packaging and their disposal, which covers also the concentration levels of heavy metals.

They can therefore be handled as industrial waste and disposed of in accordance with local regulations. Ribbon supports are made of cardboard or polystyrene, while packages are manufactured from recycled cardboard and polyethylene film.



Area of the thermal regenerative oxidiser unit showing the chimneys (one for each machine). Each chimney includes an adjustable-flow bypass and fire valves as well as an automatic pressure control system on the ink-laying machines outlets, which is assured independently from the number of chimneys in operation. One of the project's most difficult tasks was to guarantee, regardless of the number of machines connected to the unit, that a uniform pressure would be maintained at the ink-laying machines outlets, because even small deviations from this parameter would have had negative consequences on the production process.

All-Italian Technology

The turnkey installation of this incinerator at Armor's La Chevrolière was the work of ITAS, an engineering company that has become an international reference point in the field of industrial combustion. ITAS took on the role of leading contractor for the entire operation. The challenge at Armor was the

inability of the existing thermal destruction plant (which had been subject by ITAS to various revampings throughout the years) to treat the emissions generated by the 38 ink laying machines operating on site. Following an engineering survey covering among other things volumes to be treated and solvent concentrations, ITAS recommended the installation of a seven-tower Rigetherm® post-combustion unit in conjunction with an ITAS MIX JET

All in all, the different technological solutions adopted allow the unit to perform two important additional energy saving and recovery functions, alongside its basic role of thermal destructor of solvents:



Equipment used by APAVE to test the post-combustion unit.

- A) Saving of fuel and electricity. Thanks to ITAS MIX JET flameless system, the unit's fuel consumption is up to 40% lower than in a similar system and the fan supplying air to the burners operates in shorter cycles, thus allowing a saving of electrical power.
- B) Production of steam. Part of the energy generated during the thermal destruction of solvents is recuperated through the production of steam by a recovery boiler.

THE BOTTOM LINE IS THE UNIT'S CAPACITY TO TREAT 250,000 Nm³/h OF EMISSIONS AND PRODUCTION OF 12 TONNES PER HOUR OF STEAM AT 9 BAR.

Plant description

The regenerative post-combustion unit operates on the heat absorption and release principle of ceramic masses housed in seven towers. It comprises a 450 kW twin fan unit with a maximum capacity of 137,000 normal cubic meters each. The fans convey the air to the 7-tower system featuring 14 intercept valves controlling the inlet and outlet of each chamber. The operating temperature in the chambers is reached at start-up using five burners working independently from each other and that can attain a total maximum power of 7,500 kW. When the solvents in the flow exceed the minimum level required for the thermal plant to support itself, a steam boiler comes into operation to integrate the plant's central thermal unit, thus making the recourse to other boilers in the factory unnecessary. While these are fired by methane, the unit's boiler uses the solvents' entalpic energy to produce 12 tonnes per hour of steam at 9 bar. The supply included the connecting network between the post-combustion unit's boiler and the factory production unit's boiler room and the network connecting the 38 chimneys. This means that the production unit's machines and the post-combustion unit are connected by a network, managed entirely by ITAS, with a control system of draught, flow rate and pressure for each chimney. The entire flow collected through the network is conveyed to the post-combustion unit (which is so flexible as to be able to operate, in the extreme even with one chimney only) up to the maximum capacity of the 38 chimneys of 250,000 normal cubic meter (as mentioned above), without affecting the normal production cycle.

THE EMISSIONS WERE GUARANTEE TO CONFORM TO EXISTING LEGISLATION, BUT THEY CONSISTENTLY RECORDED LEVELS BELOW THE MINIMUM REQUIREMENTS

A test of experience and efficiency



region of Nantes, where weather conditions, often characterised by torrential rain and snow, were far from ideal. Moreover, the post-combustion unit had to be installed outside the factory, with most of the ductings, with diameters varying from 400 to 2800 mm, on the roof. This required additional static checks of the buildings' structure. The tubes design had also to take into account the fact that they are operating under vacuum conditions. Special cranes had to be used for assembling the chimneys. The machinery in the factory too had to undergo some modifications concerning mainly the increase of air recirculation and more efficient extraction to improve the environmental conditions inside the factory. Finally, the unit was started according to the schedule guaranteed to the customer, as evidenced by the various tests for thermal balances, destruction efficiency and energy recuperation made by the French technical inspection and certification authority APAVE.

During the construction of the post-combustion unit several obstacles, though anticipated, presented challenges of different types. To begin with, the unit was assembled entirely by ITAS Italian personnel in the Atlantic

METHANE CONSUMPTION IS PRACTICALLY NONEXISTENT: THE BURNERS ARE USED ONLY DURING START-UP



Operation of the post-combustion unit showing the monitoring of inlet and outlet chambers, the fans operation with data on flow rate, temperatures and pressures as well as the burners' performance.

