CGT, PGT CLAIM FUEL SAVINGS, ELIMINATION OF GREENHOUSE GASES

If you were to name the hot environmental topics today, what would they be? Climate change? Greenhouse gases? Global warming? Hazardous air pollutants? Acid rain? Non-renewable fuels? Formaldehyde? Methanol? NOx? Carbon credits? There are likely more that you can name. When we look at a new technology called CGT, Catalytic Gas Treatment, relative to these environmental hot topics, we find a technology that is in the right place at the right time.

CGT (US Patent No. 7,304,187) is a proven technology for which TurboSonic has worldwide marketing rights, with several installations that have been operating successfully for three years. CGT eliminates the use of non-renewable fuels used in thermal oxidizers for the destruction of hazardous air pollutants such as formaldehyde and methanol. It eliminates the generation of nitrogen oxides and greenhouse gases such as carbon dioxide from combustion and the related contribution to global warming and climate change, while generating the potential for significant carbon credits.

CGT is composed of two distinct technologies and choices. The original CGT utilizes an alkaline solution containing peroxide and two catalysts for the chemical oxidation of aldehydes (formaldehyde), while the PGT (Photo-catalytic Gas Treatment) utilizes an acidic solution containing peroxide and two catalysts in the presence of UV light to destroy a wide range of aldehydes and alcohols (methanol).

HOW IT WORKS

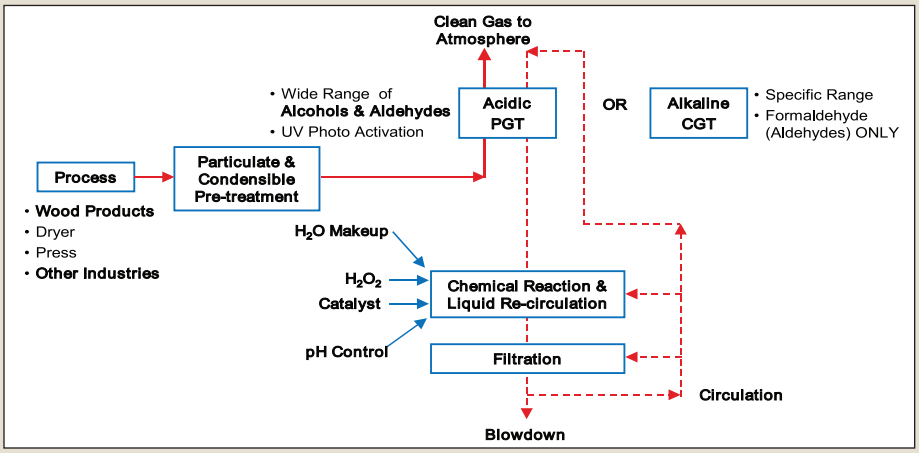
The Catalytic Gas Treatment (CGT) system developed and patented by PROCD Groupe Conseil uses a simple process to absorb aldehydes from industrial process gas streams. The system uses hydrogen peroxide (H_2O_2), sodium hydroxide (NaOH), and aqueous catalysts to capture and oxidize the VOCs to non-volatile end products. CGT chemical oxidation is a lower cost alternative to thermal oxidation using a regenerative thermal oxidizer (RTO).

The process gas is introduced into a packed tower, irrigated with an aqueous alkaline solution containing two catalysts and dilute peroxide. As the process gas flows upward through the tower, formaldehyde is absorbed into the solution. The tower has a single stage of random packing that provides interfacial area between the water solution and the gas.

The loaded solution from the packed tower drains into a reaction tank, where the absorbed formaldehyde is catalytically oxidized by hydrogen peroxide (H_2O_2) to sodium formate (NaCOOH). The high solubility of the sodium formate end product permits operation with a minimum blowdown volume.

The Photo-catalytic Gas Treatment (PGT) system, developed by PROCD Groupe Conseil, uses a similar process but absorbs both aldehydes and alcohols

Installation in progress at Uniboard in Moncure



Catalytic Gas Treatment (CGT)

from industrial process gas streams. The system uses hydrogen peroxide (H_2O_2), pH control with nitric acid (HNO_3), aqueous catalysts and UV light to oxidize the VOCs to carbon dioxide. The carbon dioxide end product gases out of the recirculated solution, minimizing the required blowdown volume.

The reaction tank is equipped with banks of UV lamps to provide photo-activation for the oxidizing pathway reactions, accelerating the reaction rates by a factor of 250 times.

Both CGT and PGT offer a biodegradable effluent, handle wide variations in VOC concentrations, generate no smog-producing NOx, have no sensitivity to temperature, as is the case with biofiltration, and have "instant on" capabilities unlike both biofiltration and thermal oxidation, thereby eliminating standby operating costs. CGT and PGT offer a return on investment based on RTO fuel savings and eliminate combustion-related greenhouse gases, which will qualify for carbon credits under proposed cap-and-trade legislation.

Following are four tables showing typical CGT and PGT operational information as well as actual operating parameters and costs for a CGT installation on a particleboard press.

Thermal oxidation requires the heating of 100% of a gas stream to 1500ºF to destroy pollutants representing less than 0.1% of the volume of the gas stream. In contrast, CGT targets only destruction of the pollutants with low concentrations of environmentally friendly peroxide.

On Wednesday, September 30, 2009, the EPA administrator announced: "Proposed regulations would require power plants, factories and refineries to reduce greenhouse gases by installing the best available technology…The Environmental Protection Agency proposal announced Wednesday applies to any industrial plant that emits at least 25,000 tons of greenhouse gases a year."

In one example of a CGT application, we can create a 34,000 ton per year reduction in carbon dioxide emissions, which at $10 to $30/ton provides a glimpse of the importance of this new technology.

Given the current focus on environmental stewardship, greenhouse gas reduction and conservation of non-renewable fuels, the introduction of CGT technology could not come at a better time. **PW**

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Table I: Typical CGT Installation

Flow Rate	100,000 scfm (167,540 Nm^3/hr, dry)
Initial concentration HCOH	28 ppmv (30 mg/m^3)
Desired HCOH reduction	95%
Recirculated water	1,250 gpm (4,730 l/min)
Purged water	3.5 gpm (13 l/min)
H_2O_2 – 50%	4 gph (15 l/hr)
NaOH – 50%	2.7 gph (10 l/hr)
Catalyst	0.2 gph (0.8 l/hr)

Table II: CGT Case Study

Particleboard press emission treatment
Pre-scrubbing and Catalytic Gas Treatment

	Inlet	Outlet
Gas Flow	47,000 scfm	
	80,000 Nm^3/hr, dry	
Relative Humidity (%)	30	100
Temperature (°C)	43	23
Formaldehyde and other oxidizable VOCs	85 ppmv (93 mg/m^3)	1.8 ppmv (2 mg/m^3)
Efficiency (%)	—	> 97
Operation/Chemical Cost (H_2O_2, NaOH, Catalyst A&B)	$67,500/year	
Maintenance Cost	$2,250/year	

Table III: Typical PGT Installation

Flow Rate	100,000 scfm (167,540 Nm^3/hr, dry)
Initial concentration HCOH	25 ppmv (28 mg/m^3)
Initial concentration CH_3OH	25 ppmv (30 mg/m^3)
Desired reduction (for HCOH and CH_3OH)	95%
Recirculated water	5,000 gpm (18,900 l/min)
Purged water	5.0 gpm (19 l/min)
H_2O_2 – 50%	18 gph (68 l/hr)
HNO_3 – 50%	0.9 gph (3.4 l/hr)
Catalyst	1.5 gph (5.5 l/hr)

Note: Above operating parameters are design conditions to be optimized (reduced) on startup.

Table IV: PGT Case Study

MDF dryer emission treatment (under construction)
Pre-scrubbing and photo-catalytic gas treatment

Flow Rate	200,000 scfm (335,000 Nm^3/h, dry)
Initial concentration HCOH	55 ppmv (60 mg/m^3)
Initial concentration CH_3OH	34 ppmv (40 mg/m^3)
Design Removal Efficiency	> 90%

Note: Design and operating parameters demonstrated in pilot testing.