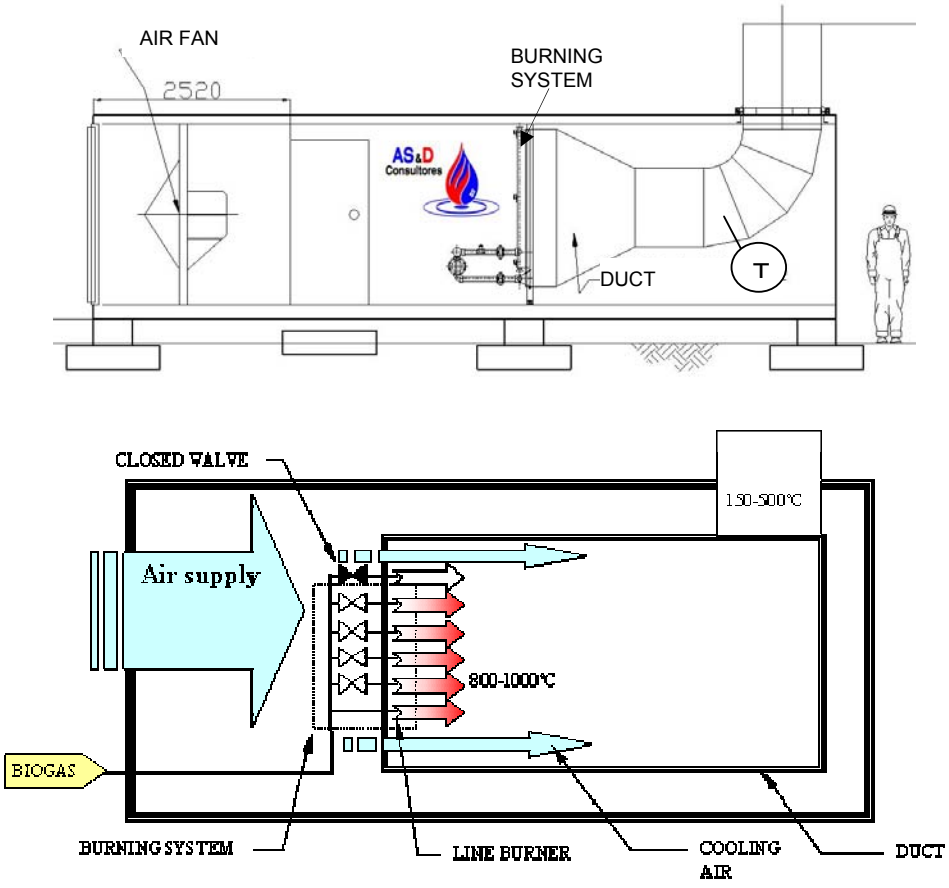
SANTA MARTA LANDFILL FLARING PLANT:
DESCRIPTION OF FLARE AND EFFICIENCY OF CH4 DESTRUCTION.

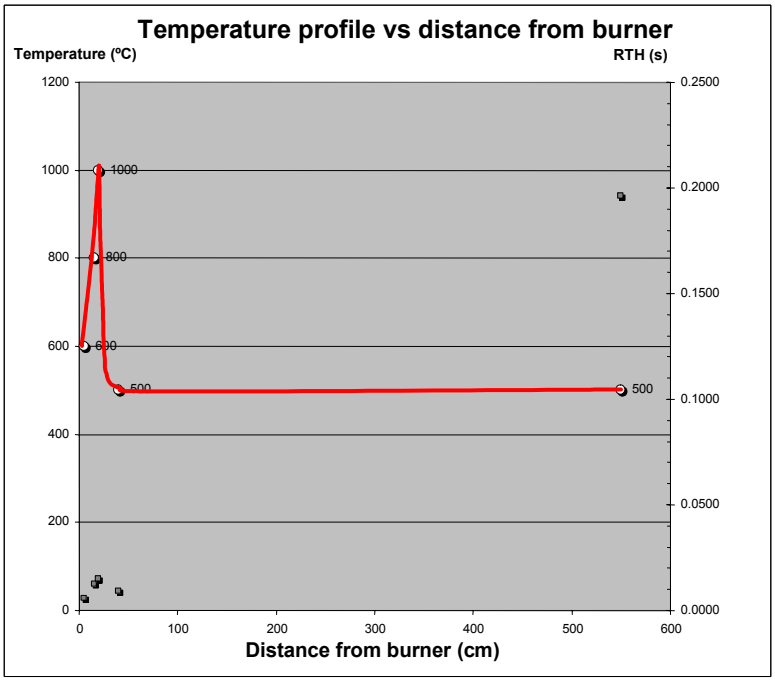
1. DESCRIPTION OF FLARE AND BURNERS

In compliance with ACM0001, in order to obtain a demonstrable and very efficient independent combustion with a large turn-over (biogas range flow capacity superior to 1:10 per flare) that allows extension of operational flexibility, in 2006 AS&D Consultores (ASD) developed a special flaring unit (entitled Biotorcha). This unit is an enclosed flare where the residual gas is burned in a rectilinear and horizontal enclosure, which includes a burning system especially designed for high efficiency and a large turn-over, where the air is admitted through a fan. The temperature combustion reaches 800 to 1000ºC, and to avoid NOx emissions, the flared gas is immediately cooled with additional air introduced just after complete combustion. The burning system is composed of six Rectangular Line Burners (RLB) that provide a direct fire in-the-duct with a greatly reduced generation of NOx, so ensuring maximum efficiency. Five RLB are connected to a valve that allows burning flow to be reduced from 1.200 to 100 m3/h without altering flaring efficiency. This explains why efficiency is maintained, even if residual gas flow is reduced, and the temperature of flared gases measured inside the duct is cooled and drops down to 150ºC.



Drawing 1: Dimensional drawing and general scheme of flare unit (*Biotorcha*)

It is important to not confuse flame temperature with exhaust gas temperature which is lower and dependent with fresh air ratio introduced after the combustion (see graphic here after). According biogas flow and the number of burner functioning (the thermal energy introduced), the exhaust gases temperature can fluctuate because of an immediate cooling with a constant fresh air flow (different from air combustion).

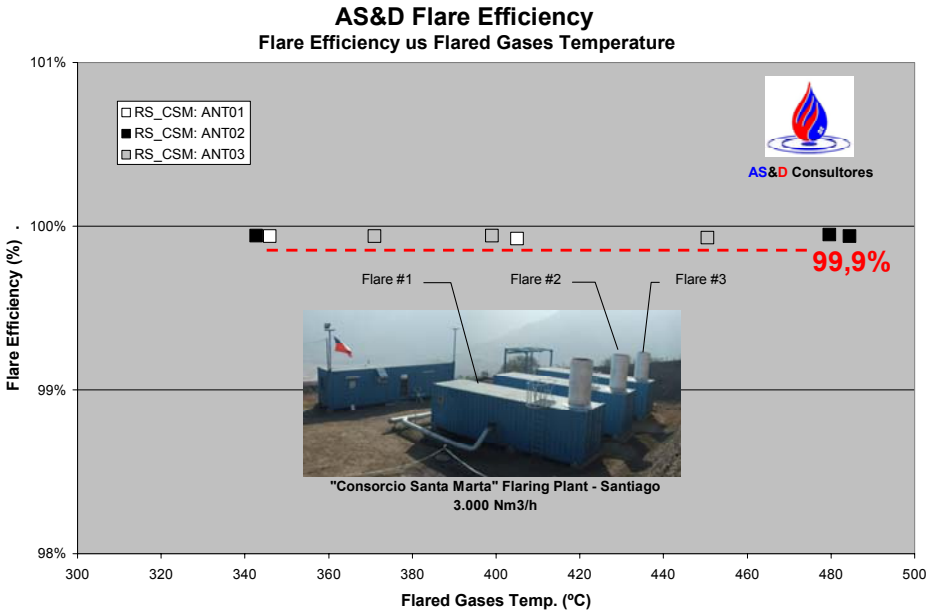


2. EFFICIENCY RESULTS

Efficiency calculations have been made in the "Santa Marta" Landfill – Santiago, June 2007 – in the presence of SGS, using a direct method o efficiency calculation with mass flow balance (using a *pitot* tube for flared gas flow). We have also results of efficiencies obtained with AS&D flares installed in the Valparaiso Landfill ("El Molle" – March 2007) where the method indicated in EB28 Annex 13 has been integrally employed. In both cases, flares were operated by operators in charge (not AS&D), and analysis of exhaust gases made by a certified laboratory (GasValpo S.A.) and results were similar.

Because exhaust gases are diluted with fresh air, methane concentrations are not detectable by conventional and portable analyzer (%vol.). Neither with some chromatograph analyzers (ppm). However, to calculate the methane mass flow rate in EG (TM_{FG}), the minimal detection level of analyzer as the value of volumetric fraction of methane in EG ($fv_{CH4,FG}$) is taken into account; in other words, considering $fv_{CH4,FG}$ = 10ppm = 10e-5 vol. In October 2007 it has been demonstrated that the 10 ppm value was conservative because new measures made with a more sophisticate analyzer obtain CH4 concentration of 1.3 to 1.6 ppm in exhaust gases[1].

Therefore, efficiency calculations we present are based on three flares[2] operated in different conditions of exhaust gas temperatures (depending on Residual Gas flow rate and/or velocity of air fan). Results are presented in the graph.



This graph shows that even exhaust gas temperatures are less then 500ºC, all flares can reach al least a 99.9% level of methane destruction, independent of equipment, flared gas temperature, and its associated corollary: rpm of air fan.

Jean-François BRADFER
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[1] Measures made in Santa Marta – October 12th, 2007.
[2] Three in Santiago (*Consorcio Santa Marta*) - Chile