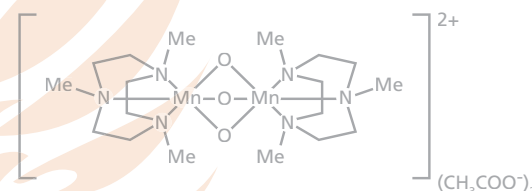


Introduction

Oxidative destruction of organic waste materials can be dramatically improved through the use of Dragon in combination with hydrogen peroxide or a physical "Advanced Oxidation Process" (AOP) such as UV, Electrochemical or Ozone

Dragon A350

Dragon is a powerful activator of hydrogen peroxide and was originally designed to destroy persistent polyphenolic stains, i.e. tea, coffee, curry and red wine, or long chain aliphatic stains such as pasta sauce.



How Dragon works

Dragon is highly stable in alkaline media compared to simple manganese salts, due to the stabilizing effect of its ligand (N,N',N''-trimethyl-1,4,7-triazacyclononane). In aqueous environments such as in waste water treatment, Dragon attacks organic compounds by abstracting H* or by transferring O-atoms to the substrate. The latter reaction directly helps to decrease the COD of the solution. Dragon operates most effectively between pH 8-10.

Industries served

Dragon can be used in the treatment of municipal solid waste condensates, textile, leather, pharmaceutical, agrochemical, petrochemical, fine chemical, meat processing, oil and gas, and many other industrial waste streams. The catalyst improves the efficiency of removing colour, odour, COD and toxic components in waste water systems and other effluent streams.

Dragon and hydrogen peroxide

Dragon activated hydrogen peroxide is well suited to bleach dye waste streams produced in the textile industry. Within one hour at least 90% of colour can be removed, whilst hydrogen peroxide used alone gives less than 10% bleaching.



Waste water sample from dye house before (right) and after treatment with Dragon/Hydrogen peroxide (left)

Compared to the Fenton system, a Dragon-based solution provides a milder pH (requiring less neutralizing chemicals) and a lower level of hydrogen peroxide. The catalyst is effective at a low dosage level and turbidity is not an issue compared to UV treatment systems. Operating temperatures are generally low (around 50°C).

Dragon in combination with physical AOP systems

The combination of Dragon with, Electrochemical, UV or Ozone systems can be used as either a standalone treatment process or as a pre-treatment prior to the biological plant. It can be used to remove a wide range of recalcitrant and/or toxic compounds, whilst increasing the biodegradability. The combination systems can also be used as tertiary treatment to remove recalcitrant micro-pollutants or when taken to the extreme, water recycle and reuse is possible.

For example, the advanced Electrochemical oxidation systems that are used together with Dragon, oxidise organic pollutants at the surface of the electrodes and in solution by primary oxidants (*OH). Minute amounts of Dragon are able to accelerate the degradation rate of organic pollutants so that higher flow rates can be treated at lower capital costs. Effluent streams with high COD (up to 300,000 mg/l)* can also be efficiently treated. In the following table, examples of COD removal with a Dragon/Electrochemical system - for various effluent types - are presented.

*Depends on flow rate (m³/h)

Effluent source ²	Initial COD mg/l	COD mg/l after D/E ¹
Engineering industry	207,300	34,050
Oil and gas industry	12,765	4,425
Fine chemical industry 1	>15,000	0
Agrochemical industry	27,000	1000
Leather tanning	80,000	6000
Fine chemical industry 2	4000	50
Municipal solid waste condensate	2000	200

¹ Further treatment would reduce COD to lower levels as required by the customer

² Acknowledgement to Alan Wakeling, Advanced Oxidation Limited

How we work/how to reach us

Our approach can be divided in 6 stages: (i) introductory meeting where we discuss your waste effluent issues (ii) signing of a confidentiality agreement (iii) Sampling and testing at our lab facilities (iv) capital and operating costs estimation (v) pilot trials on site with a mobile pilot plant (vi) Commercial proposal with guarantees.

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