

## TECHNICAL BULLETIN

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### Grapevine, TX Case Study Hydrogen Sulfide, Ammonia, and Mercaptan Removal from Air Using DARCO<sup>®</sup> H<sub>2</sub>S

#### Introduction

Nuisance odors occur in many plant operations. In processes such as wastewater treatment plants (WWTP) and lift stations, where biological activity is present, hydrogen sulfide (H<sub>2</sub>S), ammonia (NH<sub>3</sub>), and mercaptans cause the majority of the odor. Usually, the H<sub>2</sub>S and mercaptans are present in the air stream at about a 9:1 ratio respectively. Human olfactory organs are sensitive to ppb levels of H<sub>2</sub>S and therefore, the removal of the H<sub>2</sub>S generally results in a large decrease in the odor level.

#### Grapevine, TX—A Case Study

The City of Grapevine, TX Waste Water Treatment Plant (WWTP) has fugitive H<sub>2</sub>S odor at its headworks, which is typical for most WWTPs. Initial H<sub>2</sub>S measurements were made at various points at the headworks and these are reflected below. The highest concentration was seen after the headworks at the grit removal system where turbulent mixing occurs.

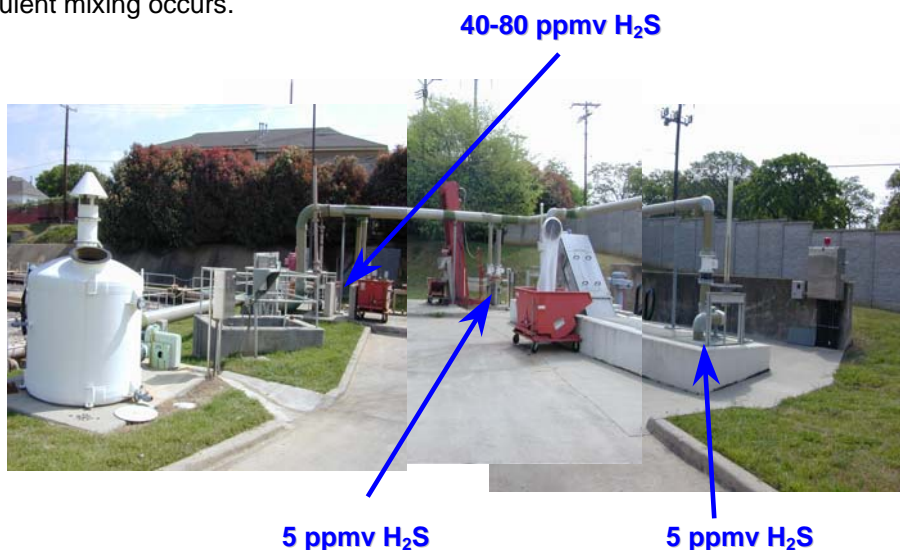


Figure 1. Odor control system located at the Grapevine, TX WWTP.  
H<sub>2</sub>S concentrations measured at various points with the odor control system turned off

Application engineers from Norit Americas Inc. evaluated the plant and concluded that DARCO H<sub>2</sub>S manufactured by Norit Americas Inc. would eliminate the malodor. In early 2005, 1000 lbs of DARCO H<sub>2</sub>S, (approximately half the design bed depth) was installed in the existing odor control unit located near the headworks. At start-up the airflow was approximately 1100 cfm with an inlet H<sub>2</sub>S concentration measured at 20 ppmv, the discharged effluent air from scrubber contained no detectable H<sub>2</sub>S or other odors.

## Operating Conditions and Measurement Equipment

The operating conditions for the Grapevine WWTP odor control unit are summarized in Table 1. The method of measurement is also listed with each of the parameters.

Parameter	Value and Units	Identification/Measurement
Odor Control Product	DARCO H <sub>2</sub> S	Lot 821355
H <sub>2</sub> S Break Through Capacity	0.22 g/cc	ASTM D-6646-03
Media Type	Activated Carbon	Non-Impregnated
Quantity	1000 lbs	
Temperature	20-40 C	DFW Airport
Relative Humidity	30-95%	DFW Airport
Flow Rate	~1100 ACFM	Major Tech MT947 Vane Anemometer
H <sub>2</sub> S Concentration	ppmv	Industrial Scientific 4 Gas Monitor P/N 1705-949
Ammonia Concentration	ppmv	GV-100S & GASTEC NO. 3L
Mercaptans Concentration	ppmv	GV-100S & GASTEC NO. 70L
EBCT	~2 s	Calculated
Bed Diameter	6 ft	P&ID of Equipment
Bed Depth	1.2 ft	Measured

Table 1. Grapevine, TX WWTP odor control system operating conditions

## Results and Discussion

For several months after startup, Grapevine WWTP personnel measured the H<sub>2</sub>S concentration in the influent and effluent of the odor control unit. The data is shown in Figure 2.

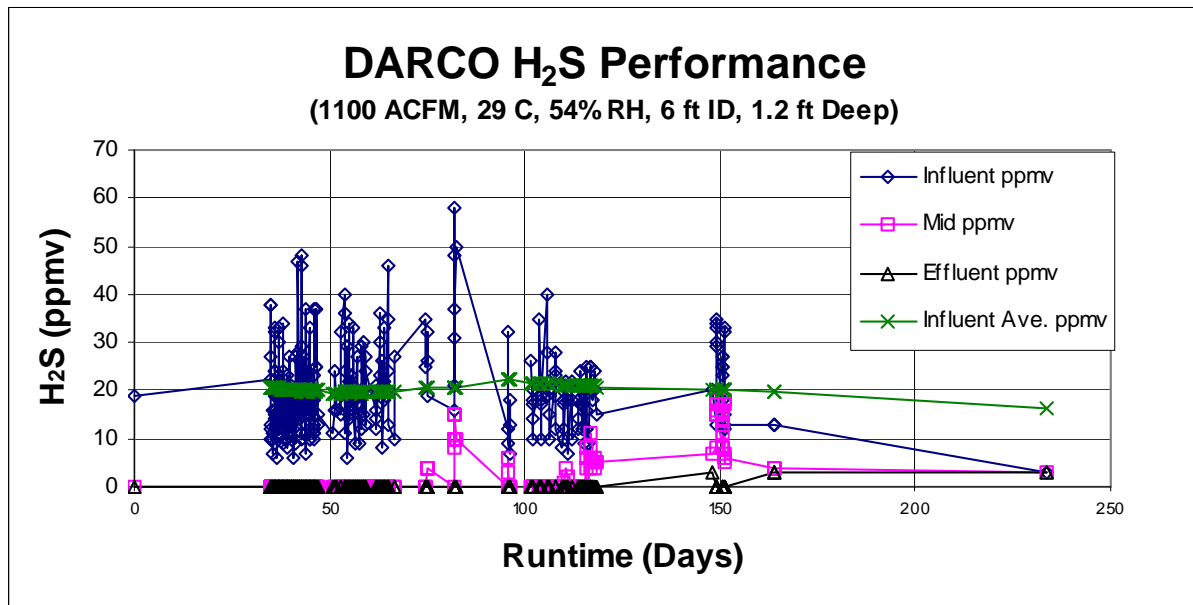


Figure 2. DARCO H<sub>2</sub>S performance data at the Grapevine, TX WWTP

## Ammonia and Mercaptans Measurements

Ammonia and mercaptans were measured several times during the test using GASTEC detector tubes and a GASTEC GV-100S hand operated tube pump. The GASTEC detector tubes indicated trace levels (<1 ppmv) of ammonia and mercaptans in the influent to the odor control unit. Ammonia and mercaptans were undetectable in the output airflow through roughly 170 days of operation. After 150 days of operation, there was no ammonia and only trace detection limit levels of mercaptans in the effluent.

## Conclusions

DARCO H<sub>2</sub>S eliminated the nuisance odor at the City of Grapevine, TX WWTP. Based on the H<sub>2</sub>S concentration in the influent, the airflow rate, and the service life of the carbon bed, the calculated H<sub>2</sub>S loading on the carbon in this plant test is 0.22 g/cc. This high removal efficiency was accomplished using DARCO H<sub>2</sub>S, which is manufactured without the use of any impregnant chemicals. As a result, this eliminates the risk of bed fires in the odor control systems, and the handling/disposal of hazardous spent materials.

The performance of DARCO H<sub>2</sub>S is described as follows by the City of Grapevine:

*"I just wanted to thank you for all...that you have done for my plant...the smell that is usually associated with the headworks area of my plant is completely gone. Even when the odor control system was first installed there was always an odor at the headworks. Even my operators have noticed the absence of the odor since the installation of your product."*

Karl Schlielig—Chief Plant Operator  
City of Grapevine, TX Waste Water Treatment Plant

## Acknowledgements

Norit Americas, Inc. would like to thank the personnel of the City of Grapevine WWTP plant for their tremendous assistance with the measurements and recordings made during this study.