

FAXED

FAX TRANSMITTAL FORM

JOHN ZINK COMPANY

A Division of Koch Engineering Company, Inc.
P.O. Box 21220
Tulsa, OK 74121-1220

DELIVER TO:	Mike Nugent/Denise Newbould	DATE:	June 1, 1995
COMPANY:	UNOCAL		
FAX NUMBER:	907/776-5579		
TOTAL PAGES:	76		
SENDER'S NAME:	T.R. Rhodes	MSG. NO.:	
YOUR REFERENCE:	Ammonia Flares	OUR REFERENCE:	AO-10770
FAX COPIES TO:			
OFFICE COPIES TO:	T.R.R.		
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NOx Generation

In the early 1980's the emissions from flares came into question. The EPA, The Chemical Manufacturers Association (CMA) and John Zink Company undertook a comprehensive flare efficiency study and test program. The details of this test program are in the following article from Pollution Engineering. The flares tested for the EPA/CMA included steam, air assisted and utility flares which cover a broad range of applications. The opportunity to test other John Zink proprietary flare tips with the EPA/CMA test set-up was used to prove our capabilities. The additional tests included testing NH₃ burning in a utility flare tip to determine NOx emissions.

Ammonia Test

- 1. Test Flare**
A John Zink U-8 utility flare was used for burning the NH₃.
- 2. Test Equipment**
The test equipment used was the same as that described in P&ID shown in the article.
- 3. Test Procedure/Sampling**
Immediately after the EPA/CMA completed their last test John Zink's tests were performed with the same personnel and procedures. The test procedure was the same as that described in the article.

4. Test Results

Based on the tests performed, a NOx generation rate of .225 lb/MMBTU of NH₃ burned was obtained for in a U-8 utility flare. Using these test results John Zink has prepared the following table for various compositions of waste gas.

Compound	Device Number	lb/hr	lb/MMBTU
NH ₃ , lb/hr	1000	1000	
Natural Gas, lb/hr		298	
CO ₂ , lb/hr			
Total, lb/hr	1000	1298	
#/Day NOx	43.2	59.4	
LHV, Btu/SCF	359	500	

Regards,

JOHN ZINK COMPANY

T.R. Rhodes

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DELIVER TO: Denise Newbold DATE: February 4, 1994
 COMPANY: Unocal Kenai
 FAX NUMBER: 907/776-5579
 TOTAL PAGES: 1

SENDER'S NAME: Walt Swander MSG. NO.:

YOUR REFERENCE: NOx Emissions for various Compositions OUR REFERENCE:

FAX COPIES TO: JZ West

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NH ₃ (#/hr)	1000	1000	1000	1000
Natural Gas		298	54	1355
CO ₂			2584	2584
Total	<u>1000</u>	<u>1298</u>	<u>3638</u>	<u>4939</u>
#/Day NOx	43.2	59.4	36.0 .04%	87.0
Btu/SCF	359	500	200	500

Obviously we don't pretend to be as accurate as these indicate. I have used prediction techniques I would use for flares in critical service where ground concentration may be monitored. I just didn't round off.

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