FIREFIGHTER TRAINING FACILITIES

By

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ABSTRACT

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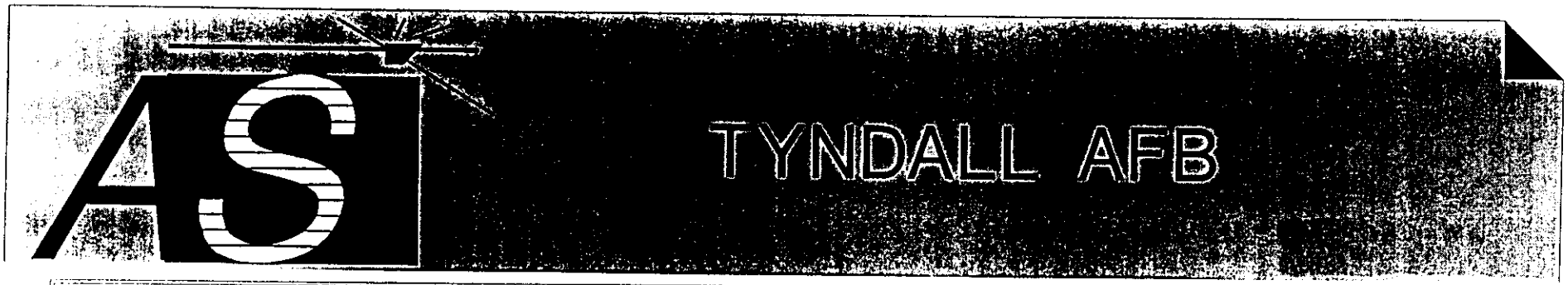
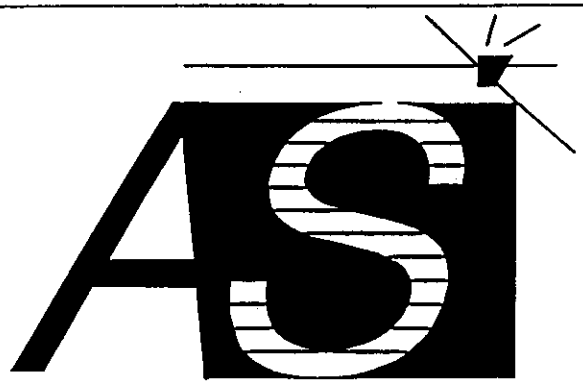
FIREFIGHTER TRAINING FACILITIES

In recent years, firefighter training facility (FTF) wastewater has come under scrutiny from regulatory authorities due to the potential for containing Resource Conservation and Recovery Act (RCRA) hazardous components. Additionally, since the majority of Air Force bases throughout the country have at least one and often several facilities and since most FTF's were operated prior to RCRA, a strong potential for soil and surface water contamination exists. Also, regulatory pressure is being felt as a result of identification by the Installation Restoration Program (IRP) of almost all past FTF's as sources of contamination at Air Force installations. The regulatory agencies can refuse to allow any discharge from FTF's until wastewater components of training fire fuels, fire extinguishing agents and combustion products are identified and quantified. The Air Force, however, is faced with a dilemma since firefighter training is essential to Air Force's mission. Therefore, the effort of this research has been to develop the analytical methodologies to identify and quantify environmental groundwater and soil contaminants of concern found in or derived from fire training facility process water and wastewater containment, treatment systems, and related activities. Primary process water constituents include residual fuel, fire suppressant agents, their combustion and degradation products. An exhaustive survey of all active Air Force bases, Air National Guard, and Air Force Reserve units have been made. From the resultant information, classes of FTF have been developed that are characterized with respect to design, construction, operation, maintenance, process water containment measures, wastewater management, treatment practices and local regulatory standards. Additionally, this work will determine wastewater characteristics at selected typical active FTF's. Operational prototype base FTF's of the environmentally acceptable FTF design will be among the sites for sampling and analysis. Sampling and analysis will yield process water, wastewater, and soil overspray contamination data from the burn area, fuel/water separator, and wastewater holding pond treatment system. Prior to sampling and analysis the identification and quantification of those contaminants will be reviewed and coordinated with the appropriate regulatory agency.



FIREFIGHTER TRAINING FACILITY

PROCESS WATER AND WASTEWATER STUDY



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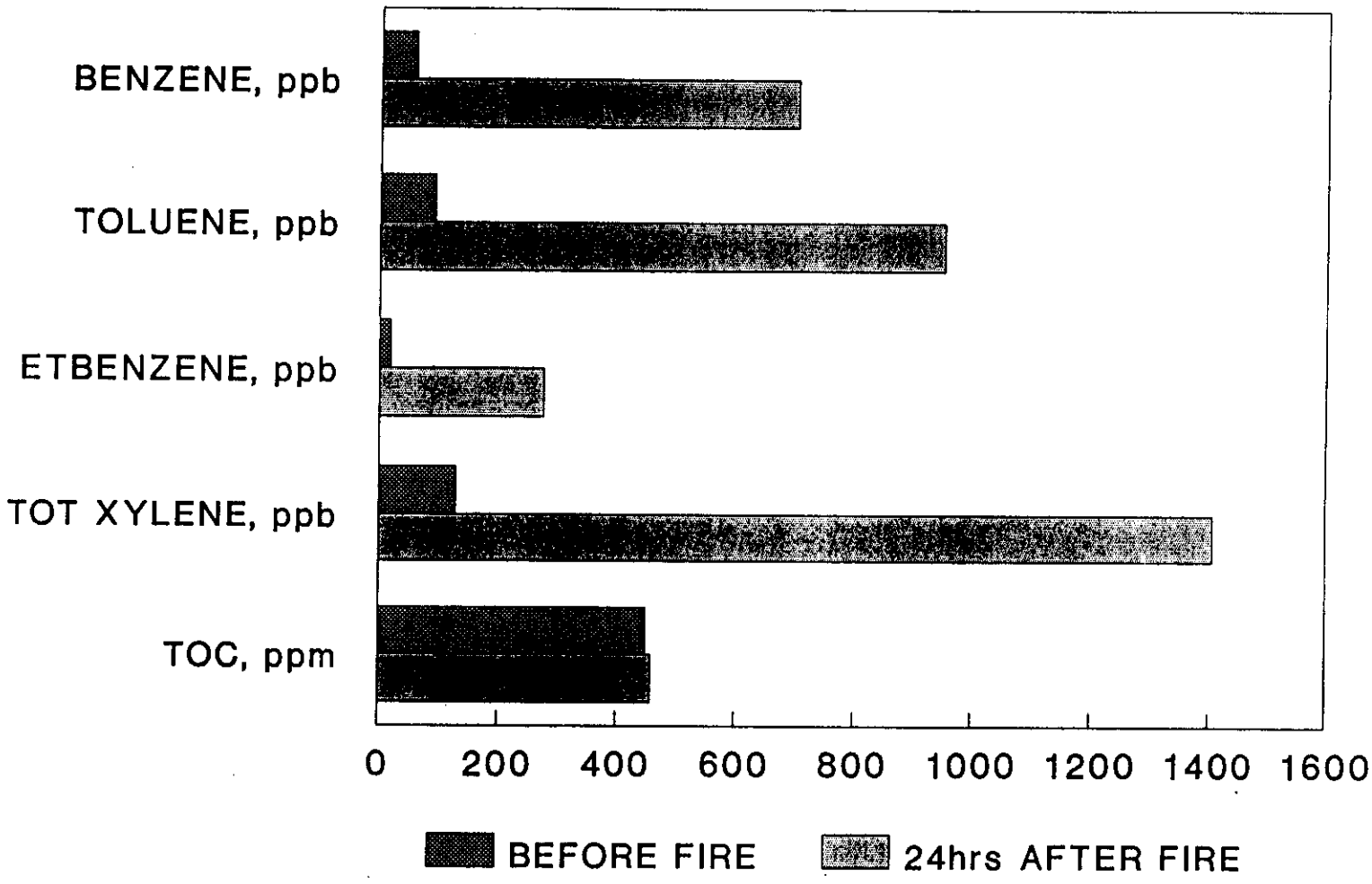
OBJECTIVES

- ENSURE USAF FIREFIGHTERS CAN MAINTAIN PROFICIENCY BY LIVE-FIRE TRAINING
- INVESTIGATE HENRY'S LAW
  - SOLUBILITY OF BENZENE IN WATER IN THE PRESENCE OF AFFF
- DEVELOP ANALYTICAL METHOD FOR AFFF
- CHARACTERIZE PROCESS & WASTEWATER
  - SAMPLE FIREFIGHTER TRAINING FACILITIES
  - ANALYZE FOR BTEX COMPOUNDS & AFFF

FTF WASTEWATER CONSTITUENTS

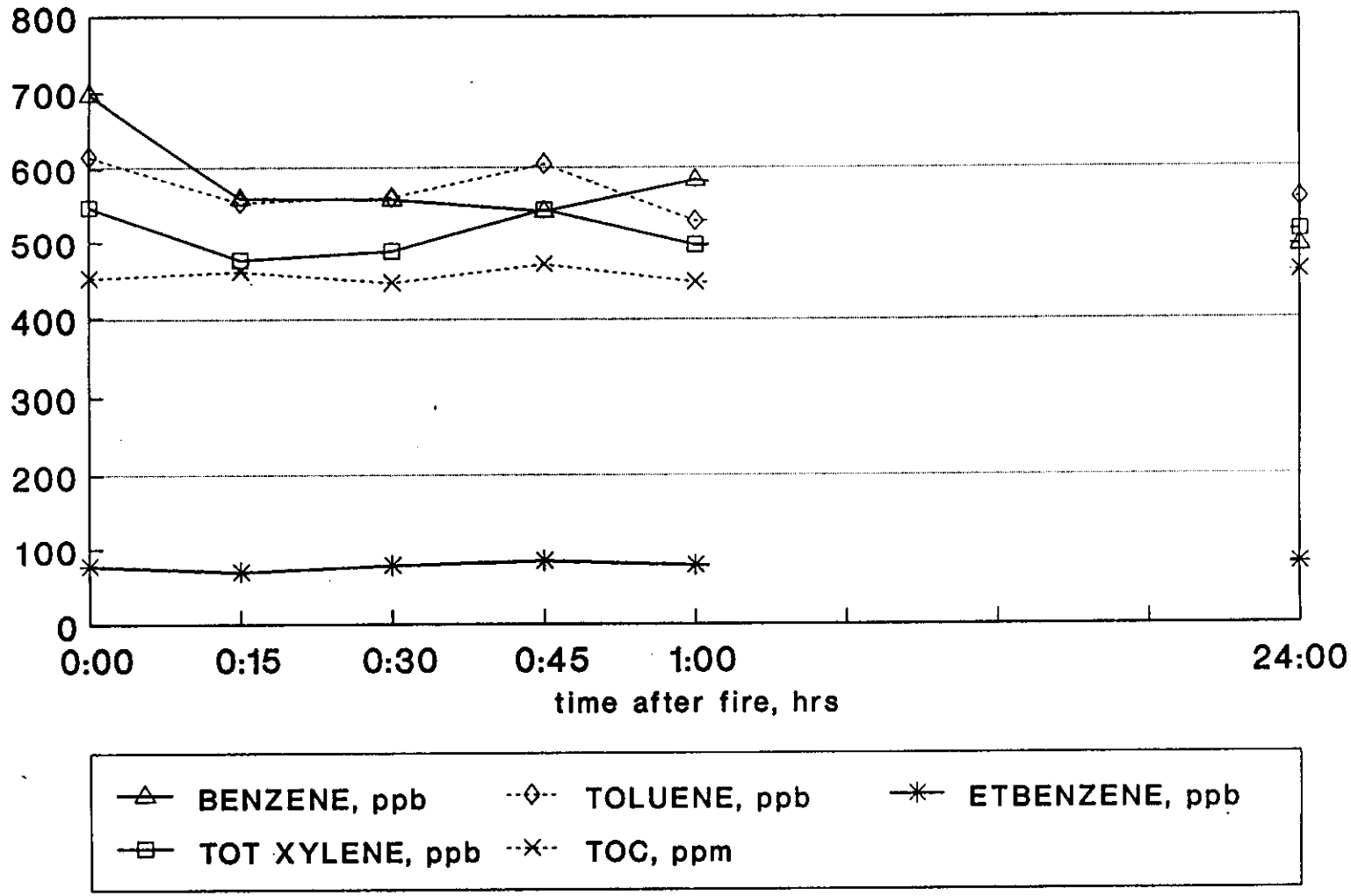
- VARIABLE MIXTURE
  - WATER
  - UNBURNED JET FUEL (JP-4)
    - -- HUNDREDS OF COMPONENTS
    - -- COMPONENTS SOLUBILIZE IN WATER
    - -- TREATABLE
  - FIRE EXTINGUISHING AGENT (AFFF)
    - -- HYDROCARBON & FLUOROCARBON SURFACTANT
    - -- BOD > 750,000 mg/L
    - -- NO STANDARD ANALYTICAL METHOD
    - -- NO KNOWN DISCHARGE STANDARDS
  - COMBUSTION PRODUCTS
    - -- ???

BURNPIT ANALYSIS

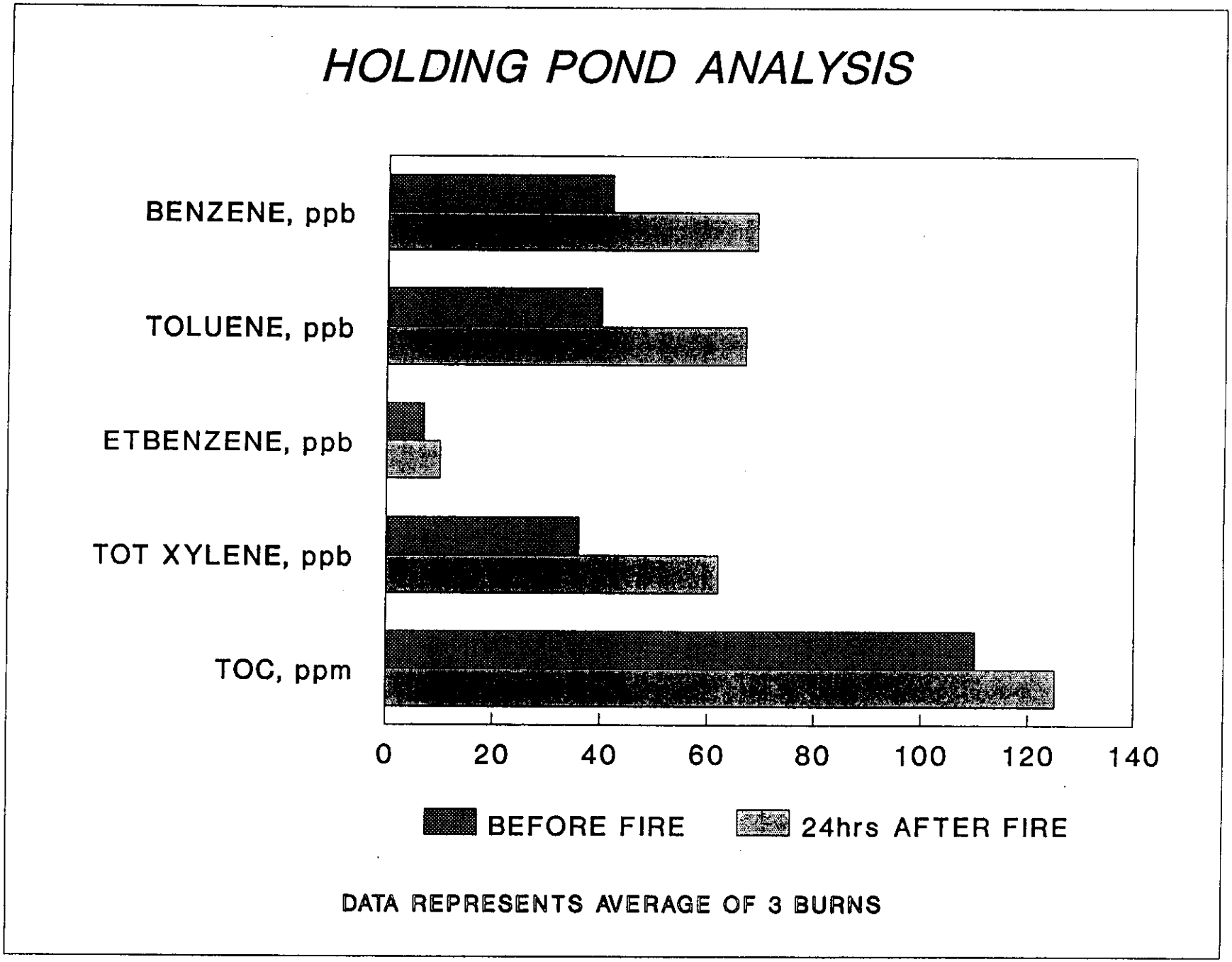


DATA REPRESENTS AVERAGE OF 3 BURNS

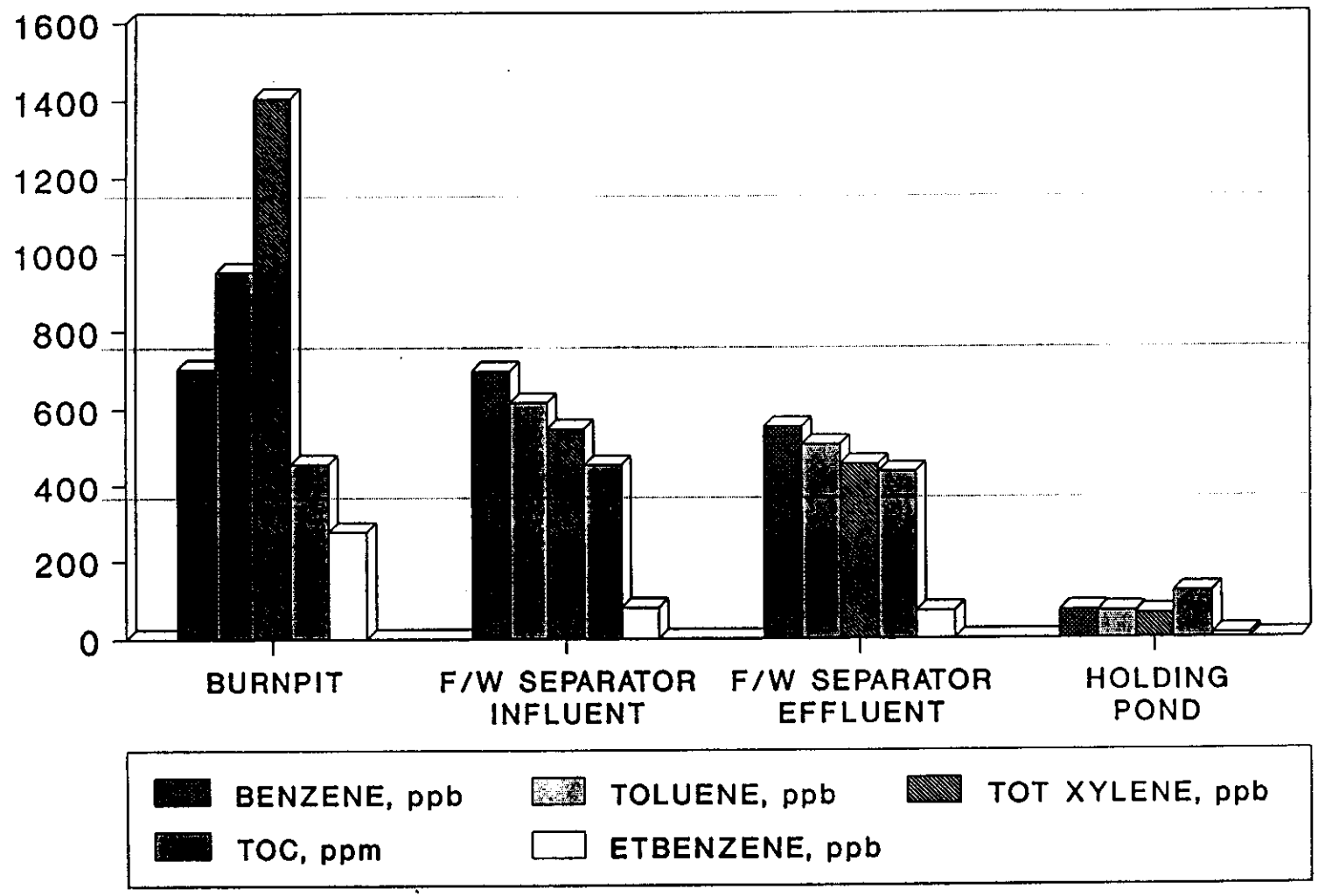
FUEL/WATER SEPARATOR ANALYSIS



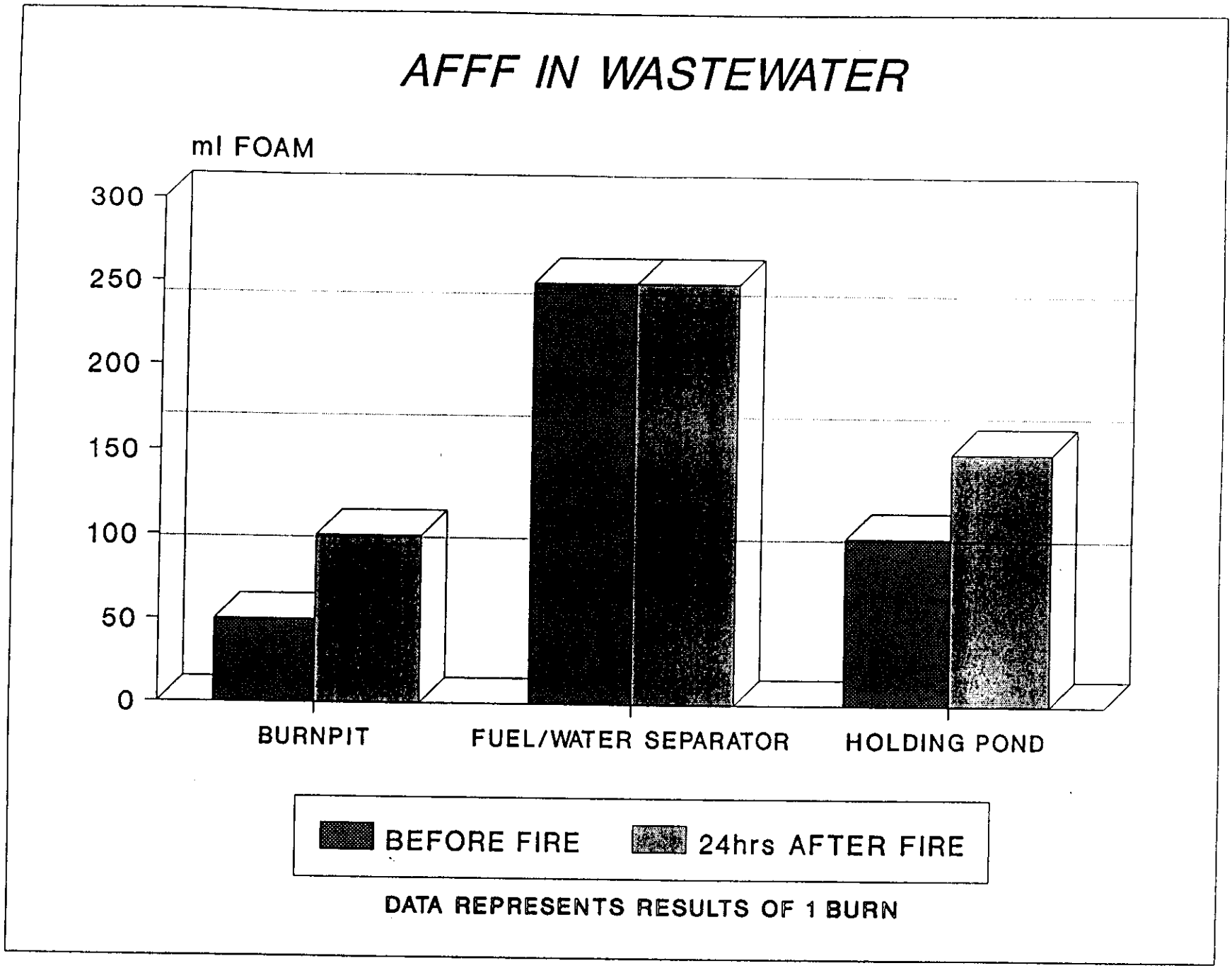
DATA REPRESENTS AVERAGE OF 3 BURNS


HOLDING POND ANALYSIS
BENZENE, ppb
TOLUENE, ppb
ETBENZENE, ppb
TOT XYLENE, ppb
TOC, ppm
0
20
40
60
80
100
120
140
BEFORE FIRE
24hrs AFTER FIRE
DATA REPRESENTS AVERAGE OF 3 BURNS

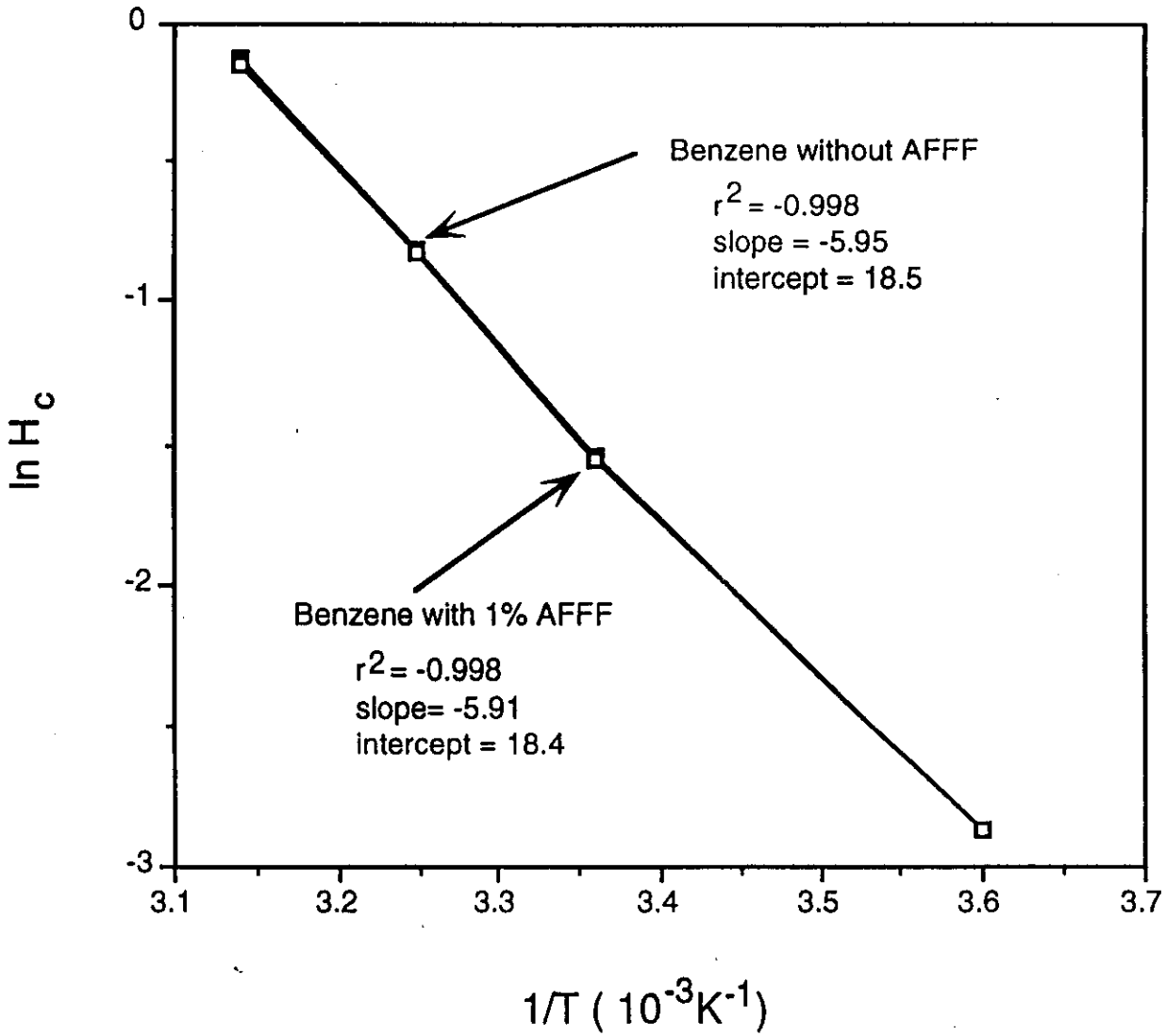
FTF WASTEWATER ANALYSIS



DATA REPRESENTS AVERAGE OF 3 BURNS


AFFF IN WASTEWATER
ml FOAM
300
250
200
150
100
50
0
BURNPIT
FUEL/WATER SEPARATOR
HOLDING POND
BEFORE FIRE
24hrs AFTER FIRE
DATA REPRESENTS RESULTS OF 1 BURN

Effect of Temperature on Henry's Law Constant (H_c)



Benzene without AFFF (■) Benzene with 1% AFFF (□)

CONCLUSIONS

- AFFF HAS MINIMAL EFFECT ON THE SOLUBILITY OF BENZENE IN WATER
  - TEMPERATURE EXHIBTED NO EFFECT

- BTEX & AFFF ARE NOT SIGNIFICANTLY REDUCED BY THE FTF FUEL/WATER SEPARATOR
  - BTEX & TOC REMAINED RELATIVELY CONSTANT
  - AFFF INCREASED SIGNIFICANTLY

- CONTAMINANT REDUCTION IN THE HOLDING POND APPEARS TO BE DUE TO DILUTION & VOLATILITY

RECOMMENDED FUTURE RESEARCH

- CONDUCT ENVIRONMENTAL FATE & TRANSPORT STUDY OF BTEX & AFFF IN FTF

- DEVELOP ANALYTICAL METHODOLOGY FOR AFFF FLUOROCARBON & HYDROCARBON SURFACTANTS

- INVESTIGATE WASTEWATER TREATMENT OPTIONS
  - BIODEGRADATION
  - COAGULATION & SETTLING
  - CHEMICAL OXIDATION