FORMEL INDUSTRIES, INC.
FRANKLIN PARK, ILLINOIS
ADJUSTED STANDARD PETITION

TECHNICAL SUPPORT DOCUMENT

PART ONE: COMPLIANT INKS

Background

Formel's operations preclude the use of compliant inks that are less than 40% VOM (excluding water) by volume or 25% VOM by volume of the volatile content of ink. The typical flexographic inks used at Formel contain about 60% solvent (by volume) and are often diluted further in order to obtain the proper viscosity for efficient printing. Formel has attempted to use water-based inks from a wide variety of manufacturers with unacceptable results in each and every trial run.

Printing Types

Formel's production consists almost entirely of surface printing on high-slip polypropylene film. Surface printing is included in the broad definition of flexographic printing, along with reverse printing and lamination. However, the quality demands for a surface-printed on polypropylene are unique. It is not justifiable, therefore, to subject all types of printing to the same ink material restrictions.

Reverse printing produces an image on the side of the substrate that is in contact with the product, and not the outside air. This is not an option for Formel, because a majority of the their customers are in the food industry. Reverse printing would allow the ink to come into contact with the packaged food products, which is clearly unacceptable. Formel's non-food customers can not have their product packaged in reverse printed wrapping either, for the abrasive nature of their consumer products customers tends to wear away the printed image.

The lamination process prints the image between two sheets of substrate, preventing direct contact between the product and the printed image and thereby reducing abrasion. However, economic and environmental factors prevent Formel's customers from accepting the excess packaging lamination produces.

Water Based Ink Trials

Because the customers demand surface printing, Formel attempted to surface print using water-based inks. Whereas water-based inks have proved successful in some other types of flexographic applications, Formel found that they are inappropriate for surface printing on high-slip polypropylene.

Certain Formel customers require ink that is heat-resistant. These product wraps are heat-sealed, and tests with water-based inks demonstrated that the heat-seal process would often soften the ink. Once softened, the printed image would cause stacked products to stick together. When product was separated, the labeling would pull off.

In the food industry label aesthetics are extremely important. Consumer confidence, in regard to the quality of the food inside a package, is shattered if the label itself appears to be of low or slip-shod quality. Any running, blending or deterioration of the printed food product label is unacceptable to Formel's customers. Trial runs with water-based inks repeatedly produced poor image quality.

Rarely, a trial run with a water-based ink would produce an image that could pass inspection. However, the use of water-based inks on high-slip (a material that is more prone to sliding rather than sticking to itself) polypropylene is such a tenuous process that positive results could not be repeated. These inks lack the solvent that anchor the pigment layer into the plastic. Instead, the chemicals migrate to the top of the film, where they are far more likely to run, smear or rub off.

Formel investigated water-based inks provided by at least six different major m ufacturers, including Daw, Sun, Croda, Crown Zellerbach and Spectra. In each case, the ink companies themselves abandoned the project. The manufacturers each turned their back on a potential customer because they reached the same conclusion: the problem was unsolvable.

Water-based inks take longer to dry and could also require Formel to operate their means of generating capital in an extremely inefficient manner. Other water-based inks would solidify in the roller system itself, requiring lengthy production breaks that slowed production and deteriorated equipment.

The nature of Formel's business is short-run jobs. Increasing the time spent for setting up each job, and decreasing the line speed for better drying creates an extremely inefficient production environment. The use of water-based inks increases set-up time and slows the printing line. Since Formel's customer base involves many short runs, water-based inks increase the proportion of time spent on non-productive printing line activities.

Water-based inks can not be color matched as simply as high-solvent inks. High-solvent inks can be modified on-site. Water-based inks, if they do not meet the extracting specifications of a customer when received, must be sent back to the manufacturer. In addition, a water-based ink that passes inspection for one run may not the next run.

The water-based colors often seem flat to Formel's customers, even when they do not smudge, run together or speckle. Again, this situation is unacceptable in the competitive food industry.

Finally, water-based inks are not without their own chemical shortcomings. These ink formulations require the use of hazardous materials (types not found in high-solvent inks) in order to bond properly. The food industry would (understandably) rather not be associated with such chemicals. In addition, these chemicals are so harmful that their disposal is three times as expensive as traditional solvent-based inks, creating another financial hardship for Formel.

Appended to this document are MSDSs for a sampling of water-based inks. Also included are numerous samples of typical Formel product printed with traditional inks.

PART TWO: ADD-ON CONTROL

Background

In lieu of compliant ink usage, the flexo rule would require Formel to install some type of VOM control device. Gas absorber or wet scrubber technologies are not appropriate given the high vapor pressure of flexographic ink solvents. Afterburner technology is the only remaining option. However, as presented below, this type of control device presents an undue economic burden on Formel.

Permanent Total Enclosure Requirements

Formel's pressroom is compact as configured now. Formel would need to operate the room as a Permanent Total Enclosure (PTE) in order to ensure compliance. However, in order to provide employees with acceptable working conditions (i.e.; keep solvent concentration in the work area less than 50% of OSHA Permissible Exposure Limits), at least 25,000 scfm of room air has to be exhausted.

Additionally, a PTE would require Formel to air condition the entire facility, which subjects them to further expenses. Control cost spreadsheets, which account for the pressroom configuration as a PTE and the air conditioning costs, have been appended to this document. Also included is a schematic of the pressroom.

Afterburner Control Costs

Formel lacks sufficient space, at ground level, to place an afterburner control unit either inside or outside their facility. The only remaining location is on the roof of their building. This incurs two major additional charges.

The first charge is for a 200-foot crane for the installation of the rooftop afterburner. The estimate for the crane rental is $15,000.

The second additional charge is to strengthen the roof supports. Formel's roof, as currently constructed, is not capable of sustaining the weight of an afterburner system. Formel has received estimates of approximately $70,000 to install structural reinforcement for the roof.

Both of these additional costs have been included in calculating the cost per ton of VOM controlled for Formel. The additional charges have been added to the control equipment cost spreadsheets under the heading "Other (auxiliary equipment, etc.)." Total cost was calculated using the procedures found in the "OAQPS Control Cost Manual (4th Edition)." Note that the basic equipment costs derived by this method are at least three years behind current prices.

As mentioned above, the control cost spreadsheets are appended to this document. A table using these figures and summarizing the cost per ton of VOM controlled is also presented. Finally, an example of an actual afterburner sales quotation is provided.

CONTROL COST SUMMARY AND DATA

Formel Industries, Inc.

Franklin Park, Illinois

Control Costs - With PTE

Total VOC to Control Device, tons		57.00		
Control, %		60.00		
Amount of VOC Controlled, tons		34.20		
Enclosure and HVAC Costs*	$	23,750		
Control Device	**Total Annual Costs**		Annual Cost Per Ton VOC Controlled	Annual Cost Per Ton VOC Controlled Including Ductwork
Recuperative Thermal Oxidizer	$	590,289	$ 17,954	$ 18,041
Regenerative Thermal Oxidizer	$	346,433	$ 10,824	$ 10,911
Gas Absorber	$	322,827	$ 10,134	$ 10,221
Ductwork	$	2,979		

* Enclosure and HVAC costs based on an annual rate of $0.10/cubic foot of facility volume.

TOTAL ANNUAL COST SPREADSHEET PROGRAM--THERMAL INCINERATORS

COST BASE DATE: April 1988 [1]

VAPCCI (Second Quarter 1996): [2] 107.9

INPUT PARAMETERS

-- Gas flowrate (scfm):	25,000
-- Reference temperature (oF):	77
-- Inlet gas temperature (oF):	100
-- Inlet gas density (lb/scf):	0.0490
-- Primary heat recovery (fraction):	0.70
-- Waste gas heat content (BTU/scf):	0.50
-- Waste gas heat content (BTU/lb):	10.20
-- Gas heat capacity (BTU/lb-oF):	0.255
-- Combustion temperature (oF):	1400
-- Preheat temperature (oF):	1010
-- Fuel heat of combustion (BTU/lb):	21502
-- Fuel density (lb/ft3):	0.0414

DESIGN PARAMETERS

-- Auxiliary Fuel Reqrmnt (lb/min):		7.143
	(scfm):	172.5
-- Total Gas Flowrate (scfm):		25173

CAPITAL COSTS

Equipment Costs ($):	
-- Incinerator:	
@ 0 % heat recovery:	0
@ 35 % heat recovery:	0
@ 50 % heat recovery:	0
@ 70 % heat recovery:	268,823
-- Other (auxiliary equipment, etc.):	85000
Total Equipment Cost--base:	353,823
" " " --escalated:	477,432
Purchased Equipment Cost ($):	563,370
Total Capital Investment ($):	907,026

ANNUAL COST INPUTS

Operating factor (hr/yr):	8400
Operating labor rate ($/hr):	13.00
Maintenance labor rate ($/hr):	14.00
Operating labor factor (hr/sh):	0.50
Maintenance labor factor (hr/sh):	0.50
Electricity price ($/kwh):	0.0501
Natural gas price ($/mscf):	4.00
Annual interest rate (fraction):	0.070
Control system life (years):	10
Capital recovery factor:	0.1424
Taxes, insurance, admin. factor:	0.04
Pressure drop (in. w.c.):	19.0

ANNUAL COSTS

Item	Cost ($/yr)	Wt. Factor	W.F.(cond.)	
Operating labor	6,825	0.012	----	
Supervisory labor	1,024	0.002	----	
Maintenance labor	7,350	0.012	----	
Maintenance materials	7,350	0.012	----	
Natural gas	347,856	0.589	----	
Electricity	40,933	0.069	----	
Overhead	13,529	0.023		0.061
Taxes, insurance, administrative	36,281	0.061	----	
Capital recovery	129,140	0.219		0.280
Total Annual Cost	590,289	1.000		1.000

NOTES:

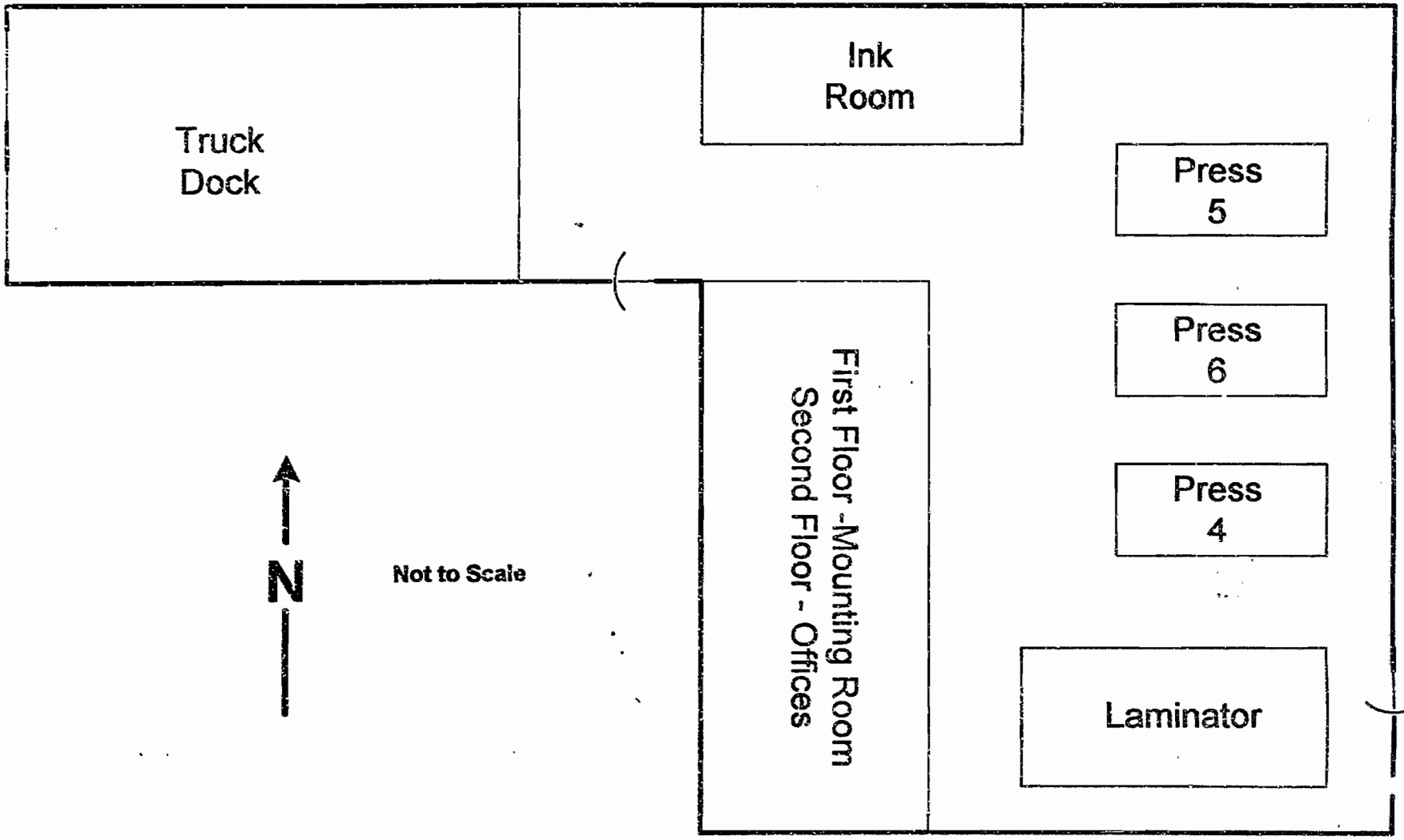
[1] Original equipment costs reflect this date.

[2] VAPCCI = Vatavuk Air Pollution Control Cost Index (for thermal incinerators) corresponding to year and quarter shown. Original equipment cost, purchased equipment cost, and total capital investment have been escalated to this data via the VAPCCI and control equipment vendor data.

Formel Industries, Inc.

Franklin Park, Illinois

Press Room Schematic



formel9961-ai\press_rm.vsd

AIR SOLUTIONS, INC.

SAMPLE WATER-BASED INK MSDS

Material Safety Data Sheet

CRODA INKS CORP. 3901 W. Rohr Ave., Milwaukee, WI. 53209
CRODAQUA ATOMIC FIRE BALL YELLOW
82-3-11268

as of May 25, 1993
This Trade Name is registered with CHEMTREC 1-800/424-9300 (USA)

SECTION 1 HAZARDOUS MATERIALS

		TWA		STEL		CEILING			
		ppm	mg/M3	ppm	mg/M3	ppm	mg/M3	SKIN	WEIGHT
AMMONIUM HYDROXIDE	OSHA	-	-	-	-	-	-	-	44.4
	ACGIH	-	-	-	-	-	-	-	
ISOPROPYL ALCOHOL	OSHA	400	980	500	1225	-	-	-	2.6
	ACGIH	400	983	500	1230	-	-	-	

TWA - Time Weighted Average; STEL - Short Term Exposure Limit
OSHA: Occupational Safety Health Admin. ACGIH: Amer. Conference of Gov. Health Hygienists

SECTION 2 PHYSICAL DATA

BOILING POINT	54 F (12 C)	SPECIFIC GRAVITY	1.13
VAPOR PRESSURE	49.34 mm OF Hg @ 68F	EVAPORATION RATE	.9
KILO PASCAL	6.6 (k Pa)	(BUTYL ACETATE = 1)	

SECTION 3 FIRE AND EXPLOSION DATA

FLASH POINT	208.3 F C.C. (97.9 C)	LOWER EXPLOSION LIMIT	2.0
		UPPER EXPLOSION LIMIT	25.0

EXTINGUISHING MEDIA
USE CARBON DIOXIDE, DRY CHEMICAL, ALCOHOL-TYPE, OR UNIVERSAL-TYPE FOAMS.

SPECIAL FIRE FIGHTING PROCEDURES
NONE KNOWN.

UNUSUAL FIRE AND EXPLOSION HAZARDS
NONE KNOWN.

SECTION 4 REACTIVITY DATA

STABLE YES

CONDITIONS TO AVOID
AVOID CONTACT WITH STRONG OXIDIZING AND/OR REDUCING AGENTS.

MATERIALS TO AVOID
THIS PRODUCT IS INCOMPATIBLE WITH STRONG OXIDIZING AND/OR REDUCING AGENTS AND STRONG ACIDS AND BASES.

HAZARDOUS DECOMPOSITION OR BY-PRODUCTS
MATERIAL WILL NOT DECOMPOSE.

HAZARDOUS POLYMERIZATION - WILL NOT OCCUR.

CONDITIONS TO AVOID
EXCESSIVE HEAT AND STRONG OXIDIZING AND REDUCING AGENTS.

SECTION 5 HEALTH HAZARD DATA

ROUTES OF ENTRY INHALATION Yes SKIN Yes INGESTION No

HEALTH HAZARDS
EYE CONTACT - IRRITATION AND POSSIBLE CORNEAL INJURY.
SKIN CONTACT-BRIEF CONTACT SHOULD NOT PRODUCE HARMFUL EFFECTS, BUT PROLONGED CONTACT MAY CAUSE IRRITATION.
INHALATION-MAY CAUSE DIZZINESS, DROWSINESS, AND/OR NAUSEA.
INGESTION-POISONOUS IF SWALLOWED.

CARCINOGENICITY

	CAS #	NTP	IARC	OSHA
AMMONIUM HYDROXIDE	1336-21-6	No	No	No
ISOPROPYL ALCOHOL	67-63-0	No	No	No

SIGNS AND SYMPTOMS OF EXPOSURE
CORROSIVE TO EYES AND SKIN, AND IS IRRITATING TO LUNGS AND NOSE RESPIRATORY TRACT AND MUCOUS MEMBRANES.

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE
RESPIRATORY PROBLEMS MAY BE AGGRAVATED BY EXPOSURE TO THIS PRODUCT. TYPICAL EXAMPLES MAY INCLUDE, BUT ARE NOT LIMITED TO EMPHYSEMA, ASTHMA, COMMON COLD, ETC.

EMERGENCY AND FIRST AID PROCEDURES
EYES-FLUSH WITH WATER, CONSULT WITH PHYSICIAN.
SKIN-FLUSH WITH WATER, CONSULT WITH PHYSICIAN.
INHALATION-REMOVE TO FRESH AIR, CONSULT WITH PHYSICIAN.

SECTION 6 PRECAUTIONS FOR SAFE HANDLING AND USE

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
NEUTRALIZE WITH DILUTE VINEGAR. ABSORB WITH INERT MATERIAL SUCH AS SAND, EARTH OR VERMICULITE.

WASTE DISPOSAL METHOD
IN COMPLIANCE WITH FEDERAL, STATE AND LOCAL REGULATIONS. SEE 40CFR 262.10 (B), 262.11 (C) & (D) AND 265.13 FOR ADDITIONAL INFORMATION

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING
AVOID CONTACT WITH EYES, SKIN, AND CLOTHING. KEEP CONTAINER CLOSED. WASH THOROUGHLY AFTER HANDLING. STORE BETWEEN 40F-120F.

OTHER PRECAUTIONS - AVOID DISCHARGE TO NATURAL WATER AND/OR SEWERS.

SECTION 7 CONTROL MEASURES

RESPIRATORY PROTECTION

THE USE OF RESPIRATORY PROTECTION DEPENDS ON VAPOR CONCENTRATION; USE A NIOSH APPROVED RESPIRATOR FOR ORGANIC VAPORS IF NEEDED.

VENTILATION

GENERAL MECHANICAL VENTILATION MAY BE SUFFICIENT TO KEEP PRODUCT VAPOR CONCENTRATIONS WITHIN SPECIFIED RANGES. IF GENERAL VENTILATION PROVES INADEQUATE TO MAINTAIN SAFE VAPOR CONCETRATIONS, SUPPLEMENTAL LOCAL EXHAUST MAY BE REQUIRED. OTHER SPECIAL PRECAUTION SUCH AS RESPIRATORY MASK OR ENVIRONMENTAL CONTAINMENT DEVICES, MAY BE REQUIRED IN EXTREME CASES.

PROTECTIVE GLOVES - IMPERMEABLE RUBBER OR PLASTIC.

EYE PROTECTION

CHEMICAL SPLASH GOGGLES (ANSI287.1) OR APPROVED EQUIVALENT.

OTHER PROTECTIVE CLOTHING OR EQUIPMENT - IMPERMEABLE APRONS.

WORK/HYGENIC PRACTICES

WASH HANDS AND FACE THOROUGHLY BEFORE EATING OR DRINKING.

ALL NUMERICAL VALUES STATED IN THIS MATERIAL SAFETY DATA SHEET ARE BASED UPON TYPICAL VALUES FROM OUR SUPPLIERS WITH A RANGE OF APPROXIMATELY PLUS OR MINUS FIVE (5) PERCENT. THESE VALUES SHOULD NOT BE CONSIDERED AS SPECIFICATIONS SINCE OUR SUPPLIERS WILL NOT GUARANTEE THE PHYSICAL CHARACTERISTICS OF THEIR PRODUCT.

THE INFORMATION CONTAINED HEREIN IS FURNISHED WITHOUT WARRANTY OF ANY KIND. USERS SHOULD CONSIDER THIS DATA ONLY AS A SUPPLEMENT TO THEIR INFORMATION GATHERED BY THEM AND MUST MAKE INDEPENDENT DETERMINATIONS OF SUITABILITY AND COMPLETENESS OF INFORMATION FROM ALL SOURCES TO ASSURE PROPER USE AND DISPOSAL OF THESE MATERIALS AND THE SAFETY AND HEALTH OF EMPLOYEES AND CUSTOMERS.

REGULATION INFORMATION

CRODAQUA ATOMIC FIRE BALL YELLOW
82-3-11268

as of May 25, 1993

TYPICAL VALUES BY WEIGHT FOR:
Solid: 38.40 Volatile: 2.60 Water: 59.00

HAZARD RATING HMIS: HEALTH : 3 FLAMMABILITY : 1 REACTIVITY : 0

This ink does not contain any component substances listed in California Proposition 65 lists which are knowingly adedd. However, printing ink ingredients, like all synthetic and naturally occurring chemicals, may contain trace contaminants of some listed substances and/or elements. These are not added to the printing ink as ingredients, but may be present in the ink raw materials as received from our suppliers over which we have no control.

SARA 302 (40 CFR 355.30)
NO MATERIALS TO REPORT

SARA 312 (40 CFR 370)

ACUTE HEALTH HAZARD Yes CHRONIC HEALTH HAZARD No
FIRE Yes SUDDEN RELEASE OF PRESSURE No REACTIVE No

SARA 313 SUPPLIER NOTIFICATION (40 CFR 372)
This product contains the following toxic chemicals subject to the reporting requirements of emergency planning and community Right-to-Know Act of 1986.

Chemical Name	CAS #	%	% as Metal
NO MATERIALS TO REPORT			

This information must be included in all MSDS that are copied and distributed for this material.

All ingredients in this product are listed in the T.S.C.A. Inventory.

The information contained herein is furnished without warranty of any kind. Users should consider these data only as a supplement to their information gathered by them and must make independent determinations of suitability and completeness of information from all sources to assure proper use and disposal of these materials and the safety and health of employees and customers.

SHIPPING INFORMATION
DOT - INK PRINTING, N.O.I.
IATA - INK,3,UN1210,PGIII
(DOT EMERGENCY RESPONSE GUIDE #26)

For more information, call MILWAUKEEE GENERAL MANAGER,
at (USA) 414/461-2300 Fax #: 414/461-3247.

INK, FLAMMABLE LIQUID, UN 1210

DOT EMERGENCY RESPONSE GUIDE #26

CHEMTREC 1-800-424-9300

REV. 12-04-90

POTENTIAL HAZARDS

FIRE OR EXPLOSION

FLAMMABLE/COMBUSTIBLE MATERIAL; MAY BE IGNITED BY HEAT, SPARKS OR FLAMES. VAPORS MAY TRAVEL TO A SOURCE OF IGNITION AND FLASH BACK. CONTAINER MAY EXPLODE IN HEAT OF FIRE. VAPOR EXPLOSION HAZARD INDOORS, OUTDOORS, OR IN SEWERS. RUNOFF TO SEWER MAY CREATE FIRE OR EXPLOSION HAZARD.

HEALTH HAZARDS

MAY BE POISONOUS IF INHALED OR ABSORBED THROUGH SKIN. VAPORS MAY CAUSE DIZZINESS OR SUFFOCATION. CONTACT MAY IRRITATE OR BURN SKIN AND EYES. FIRE MAY PRODUCE IRRITATING OR POISONOUS GASES. RUNOFF FROM FIRE CONTROL OR DILUTION WATER MAY CAUSE POLLUTION.

EMERGENCY ACTION

KEEP UNNECESSARY PEOPLE AWAY; ISOLATE HAZARD AREA AND DENY ENTRY. STAY UPWIND; KEEP OUT OF LOW AREAS. POSITIVE PRESSURE SELF-CONTAINED BREATHING APPARATUS (SCBA) AND STRUCTURAL FIREFIGHTER'S PROTECTIVE CLOTHING WILL PROVIDE LIMITED PROTECTION. ISOLATE FOR 1/2 MILE IN ALL DIRECTIONS IF TANK, RAIL CAR OR TANK TRUCK IS INVOLVED IN FIRE. CALL CHEMTREC AT 1-800-424-9300 FOR EMERGENCY ASSISTANCE. IF WATER POLLUTION OCCURS, NOTIFY THE APPROPRIATE AUTHORITIES.

FIRE

SMALL FIRES: DRY CHEMICAL, CO2, HALON, WATER SPRAY OR ALCOHOL RESISTENT FOAM.

LARGE FIRES: WATER SPRAY, FOG OR ALCOHOL RESISTENT FOAM. DO NOT USE DRY CHEMICAL EXTINGUISHERS TO CONTROL FIRES INVOLVING NITROMETHANE OR NITROETHANE. MOVE CONTAINER FROM FIRE AREA IF YOU CAN DO IT WITHOUT RISK. APPLY WATER TO SIDES OF CONTAINERS THAT ARE EXPOSED TO FLAMES UNTIL WELL AFTER FIRE IS OUT. STAY AWAY FROM ENDS OF TANKS. FOR MASSIVE FIRE IN CARGO AREA, USE UNMANNED HOSE HOLDER OR MONITOR NOZZLES; IF THIS IS IMPOSSIBLE, WITHDRAW FROM AREA AND LET FIRE BURN. WITHDRAW IMMEDIATELY IN CASE OF RISING SOUND FROM VENTING SAFETY DEVICE OR ANY DISCOLORATION OF TANK DUE TO FIRE.

SPILL OR LEAK

SHUT OFF IGNITION SOURCES; NO FLARES, SMOKING OR FLAMES IN HAZARD AREA. STOP LEAK IF YOU CAN DO IT WITHOUT RISK. WATER SPRAY MAY REDUCE VAPOR; BUT IT MAY NOT PREVENT IGNITION IN CLOSED SPACES.

SMALL SPILLS: TAKE UP WITH SAND OR OTHER NONCOMBUSTIBLE ABSORBENT MATERIAL AND PLACE INTO CONTAINERS FOR LATER DISPOSAL.

LARGE SPILLS: DIKE FAR AHEAD OF LIQUID SPILL FOR LATER DISPOSAL.

FIRST AID

MOVE VICTIM TO FRESH AIR AND CALL EMERGENCY MEDICAL CARE; IF NOT BREATHING GIVE ARTIFICIAL RESPIRATION; IF BREATHING IS DIFFICULT, GIVE OXYGEN. IN CASE OF CONTACT WITH MATERIAL, IMMEDIATELY FLUSH EYES WITH RUNNING WATER FOR AT LEAST 15 MINUTES. WASH SKIN WITH SOAP AND WATER. REMOVE AND ISOLATE CONTAMINATED CLOTHING AND SHOES AT THE SITE.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Volatile Organic Compound Data Sheet:
VOC DATA SHEET:
M24
PROPERTIES OF THE COATING "AS SUPPLIED" BY THE MANUFACTURER

Coating Manufacturer: CRODA INKS CORPORATION.

Coating Identification: CRODAQUA ATOMIC FIRE BALL YELLOW

Batch Identification: 82-3-11268

Supplied To:

Property of the coating as supplied to the customer:

A. Coating Density (Dc)s: 9.4 lb/gal 1.1 kg/l

____ASTM D1475 X Other (from formula)

B. Total Volatiles (Wv)s: 61.6 Weight Percent

____ASTM D2369 X Other (from formula)

C. Water Content: 1. (Ww)s 59.0 Weight Percent

____ASTM D3792 ____ASTM D4017 X Other (from formula)

2. (Vw)s 66.4 Volume Percent

X Calculated ____Other (from formula)

D. Organic Volatiles (Wo)s: 2.6 Weight Percent

E. Nonvolatiles Content (Vn)s: 29.8 Volume Percent

F. VOC Content (VOC)s: 1. .7 lb/gal coating less water

or .1 kg/l coating less water (87.2 g/l)

2. .8 lb/gal solids

or .1 kg/l solids (98.1 g/l)

The subscript "s" denotes each value is for the coating "as supplied" by the manufacturer.

Ratio of Water to VOC:
Volume percent VOC 5.3 Solvent density calculated from above data: 6.5
Volume percent water 94.7
C TOTAL: 100.00 %

MILWAUKEEE LOCATION GENERAL MANAGER 414/461-2300 May 25, 1993

This sheet is based on EPA document, "Procedure for Certifying Quantity of Volatile Organic Compounds Emitted by Paint, Ink, and Other Coatings", (EPA - 450/3-84-019).

FAX

Date 9-19-94

Number of pages including cover sheet 10

TO: Furlon

Phone

Fax Phone

FROM:

A J Daw Printing Ink Co.

Phone 708-482-8820

Fax Phone 708-482-8843

CC:

REMARKS: ☐ Urgent ☐ For your review ☐ Reply ASAP ☐ Please Comment

MSDS you requested

MATERIAL SAFETY DATA SHEET

PRODUCT NAME: HYDROTECH 760 TORTILLA WHITE HMIS CODES: H [illegible]
PRODUCT CODE: CW-8043

SECTION I - MANUFACTURER IDENTIFICATION

MANUFACTURER'S NAME: A.J. DAW PRINTING INK CO., INC.
ADDRESS: 3559 S. GREENWOOD AVENUE, LOS ANGELES, CA 90040
EMERGENCY PHONE: (800)424-9300 INFORMATION PHONE: (213)[illegible]
DATE REVISED : 01-24-94 NAME OF PREPARER: [illegible]
REASON REVISED : EXEMPTION OF PHOTOCHEMICALLY REACTIVE SOLVENTS [illegible] PRINTING

SECTION II - HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

HAZARDOUS COMPONENTS	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
AMMONIA, ANHYDROUS	[illegible]	50 PPM	[illegible]	[illegible]	[illegible]
ISOPROPYL ALCOHOL	[illegible]	400 PPM	[illegible]	[illegible]	[illegible]
TITANIUM DIOXIDE	13463-67-7	15 MG/M3	10 MG/M3	DUST FUMES	[illegible]
PROPYL ALCOHOL, N-PRIMARY	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible] indicates toxic chemical not [illegible]

SECTION III - PHYSICAL/CHEMICAL CHARACTERISTICS

BOILING POINT: [illegible] SPECIFIC GRAVITY (H2O=1): [illegible]
VAPOR DENSITY: [illegible] THAN AIR EVAPORATION RATE: [illegible]
COATING V.O.C. : [illegible]
MATERIAL V.O.C.: [illegible]
SOLUBILITY IN WATER: SOLUBLE
APPEARANCE AND ODOR: [illegible]

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: [illegible] METHOD USED:
FLAMMABLE LIMITS IN AIR BY VOLUME- LOWER: [illegible] UPPER: [illegible]

EXTINGUISHING MEDIA: FOAM, CO2 [illegible] SAFETY [illegible]

SPECIAL FIREFIGHTING PROCEDURES
NORMAL FIREFIGHTING PROCEDURES SHOULD BE USED. [illegible] SELF-CONTAINED [illegible] APPARATUS.

UNUSUAL FIRE AND EXPLOSION HAZARDS
EXPOSURE OF CLOSED CONTAINERS TO EXCESSIVE HEAT MAY CAUSE DISRUPTIVE PRESSURE. WATER SPRAY SHOULD BE USED TO KEEP CLOSED CONTAINERS COOL. PLASTIC CONTAINERS MAY MELT AND LEAK DURING A FIRE.

SECTION V - REACTIVITY DATA

STABILITY: STABLE

CONDITIONS TO AVOID

AVOID HEAT, FIRE AND OPEN FLAME. KEEP FROM FREEZING

INCOMPATIBILITY (MATERIALS TO AVOID)

AVOID CONTACT WITH STRONG ACIDS, ALKALIES AND OXIDIZING AGENTS

HAZARDOUS DECOMPOSITION OR BYPRODUCTS

THERMAL DECOMPOSITION MAY CREATE CARBON MONOXIDE AND OTHER TOXIC FUMES

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

NONE WILL OCCUR

SECTION VI - HEALTH HAZARD DATA

INHALATION HEALTH RISKS AND SYMPTOMS OF EXPOSURE

PROLONGED BREATHING OF VAPORS CAN CAUSE HEADACHE, NAUSEA AND/OR NARCOSIS. OVEREXPOSURE BY INHALATION MAY CAUSE IRRITATION OF LUNGS AND/OR RESPIRATORY TRACT.

SKIN AND EYE CONTACT HEALTH RISKS AND SYMPTOMS OF EXPOSURE

SKIN CONTACT MAY CAUSE IRRITATION, INCLUDING DRYNESS AND CRACKING OF THE SKIN. EYE CONTACT MAY CAUSE IRRITATION INCLUDING REDNESS AND TEARING.

SKIN ABSORPTION HEALTH RISKS AND SYMPTOMS OF EXPOSURE

PROLONGED SKIN CONTACT MAY CAUSE IRRITATION. NO SIGNIFICANT ADVERSE EFFECTS ARE KNOWN TO OCCUR THROUGH SKIN ABSORPTION.

INGESTION HEALTH RISKS AND SYMPTOMS OF EXPOSURE

INGESTION MAY CAUSE IRRITATION TO THE MOUTH, THROAT AND DIGESTIVE TRACT, AND MAY CAUSE NAUSEA, DIARRHEA OR VOMITING.

HEALTH HAZARDS (ACUTE AND CHRONIC)

ACUTE: REDNESS, DRYNESS AND CRACKING OF THE SKIN. IRRITATION OF THE THROAT, LUNGS, NOSE AND RESPIRATORY SYSTEM AND TEARING OF THE EYES

CHRONIC: NONE KNOWN.

CARCINOGENICITY: NTP? NO IARC MONOGRAPHS? NO OSHA REGULATED? NO

NOT APPLICABLE.

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE

PREEXISTING EYE, SKIN OR RESPIRATORY DISORDERS MAY BE AGGRAVATED BY EXPOSURE TO THIS PRODUCT

EMERGENCY AND FIRST AID PROCEDURES

FOR INHALATION: REMOVE TO FRESH AIR. CALL A PHYSICIAN.

SKIN CONTACT: WASH THOROUGHLY WITH SOAP AND WATER. USE A WATERLESS HAND CLEANER.

EYE CONTACT: FLUSH WITH PLENTY OF WATER. IF IRRITATION PERSISTS, CONSULT A PHYSICIAN.

FOR INGESTION: CONTACT A PHYSICIAN IMMEDIATELY.

SECTION VII - PRECAUTIONS FOR SAFE HANDLING AND USE

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

REMOVE ALL SOURCES OF IGNITION. VENTILATE AREA. DIKE SPILL AREA AND ABSORB USING A SUITABLE ABSORBENT MATERIAL.

WASTE DISPOSAL METHOD

DISPOSE OF IN ACCORDANCE WITH ALL APPLICABLE LOCAL, STATE AND FEDERAL REGULATIONS. EMPTY CONTAINERS MAY CONTAIN FLAMMABLE RESIDUE. DISPOSE OF EMPTY CONTAINERS IN ACCORDANCE WITH ALL APPLICABLE REGULATIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING

KEEP CONTAINERS CLOSED WHEN NOT IN USE. KEEP ALL FOUNTAINS, ROLLER TRAYS AND PUMP CONTAINERS COVERED TO PREVENT EVAPORATION OF THE VOLATILE PORTION OF PRODUCT. STORE AWAY FROM SOURCES OF OPEN FLAME OR EXCESSIVE HEAT. DO NOT STORE IN DIRECT SUNLIGHT. KEEP FROM FREEZING. STORE IN WELL-VENTILATED AREA.

OTHER PRECAUTIONS

AVOID PROLONGED BREATHING OF FUMES OR VAPORS. AVOID EYE CONTACT OR PROLONGED SKIN CONTACT. WASH HANDS AND ARMS AFTER USING THIS PRODUCT, ESPECIALLY BEFORE EATING OR SMOKING. THIS PRODUCT IS NOT FORMULATED FOR USE WHERE IT MAY BE A FOOD ADDITIVE.

SECTION VIII - CONTROL MEASURES

RESPIRATORY PROTECTION

AS NEEDED TO PREVENT INHALATION OF VAPORS IN EXCESS OF THE TLV.

VENTILATION

GENERAL VENTILATION WITH MINIMUM RATE OF ONE CUBIC FOOT PER MINUTE PER SQUARE FOOT OF FLOOR AREA, INCREASING RATE AS FLAMMABLE VAPORS MAY ACCUMULATE

PROTECTIVE GLOVES

PROTECTIVE GLOVES SHOULD BE WORN WHERE PROLONGED SKIN CONTACT MAY OCCUR.

EYE PROTECTION

PROTECTIVE GLASSES OR GOGGLES SHOULD BE WORN TO PREVENT SPLASH TO INTO THE EYES

OTHER PROTECTIVE CLOTHING OR EQUIPMENT

AS DEEMED NECESSARY.

WORK/HYGIENIC PRACTICES

WASH HANDS AND FACE THOROUGHLY AFTER USING THIS PRODUCT, ESPECIALLY BEFORE EATING OR SMOKING.

SECTION IX - DISCLAIMER

DISCLAIMER

YOU SHOULD CONSIDER THE ASSISTANCE OF INDIVIDUALS TRAINED IN THE PROPER EVALUATION OF HEALTH RELATED DATA. WHILE THE DAW INK COMPANY BELIEVES THAT THE DATA SET FORTH IN THIS SHEET IS ACCURATE, THE DAW INK COMPANY MAKES NO WARRANTY WITH RESPECT THERETO AND EXPRESSLY DISCLAIMS ALL LIABILITY FOR RELIANCE THEREON.

MATERIAL SAFETY DATA SHEET

PRODUCT NAME: HYDROTECH 760 SER #165C ORANGE HMIS CODES: H F R P
PRODUCT CODE: CW-5040 [illegible]

SECTION I - MANUFACTURER IDENTIFICATION

MANUFACTURER'S NAME: A.J. DAW PRINTING INK CO., INC.
ADDRESS: 3559 S. GREENWOOD AVENUE, LOS ANGELES, CA 90040
EMERGENCY PHONE: (800)424-9300 INFORMATION PHONE: (213)723-3263
DATE REVISED : 06-29-92 NAME OF PREPARER : REX R. TAMM
REASON REVISED : EXEMPTION OF PHTHALOCYANINE PIGMENTS FROM SARA 313 REPORTING

SECTION II - HAZARDOUS INGREDIENTS/SARA III INFORMATION

HAZARDOUS COMPONENTS	CAS NUMBER	OSHA PEL	ACGIH TLV	OCCUPATIONAL EXPOSURE LIMITS	VAPOR PRESSURE	
ISOPROPYL ALCOHOL	67-63-0	400 PPM	400 PPM	FLAMMABLE	33.0	@68
AMMONIA, ANHYDROUS	7664-41-7 *	50 PPM	25 PPM	CORROSIVE	6460	@68
BARIUM COMPOUND					N/A	
TITANIUM DIOXIDE	13463-67-7 *	15 MG/M3	10 MG/M3	5.5% HAZPL	N/A	
PROPYL ALCOHOL; N-PROPANOL	71-23-8	200 PPM	200 PPM	FLAMMABLE	[illegible]	[illegible]

* Indicates toxic chemical(s) subject to the reporting requirements of Section 313 of Title III and of 40 CFR 372

SECTION III - PHYSICAL/CHEMICAL CHARACTERISTICS

BOILING POINT: 212 F SPECIFIC GRAVITY (H2O=1): 1.1
VAPOR DENSITY: HEAVIER THAN AIR EVAPORATION RATE: SLOWER THAN [illegible]
COATING V.O.C. : 1.93 LB/GL (231 G/L)
MATERIAL V.O.C.: 0.81 LB/GL (97 G/L)
SOLUBILITY IN WATER: SOLUBLE
APPEARANCE AND ODOR: COLORED LIQUID; AMMONIACAL ODOR

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: OVER 140F METHOD USED: CC
FLAMMABLE LIMITS IN AIR BY VOLUME- LOWER: 2.0% UPPER: 27.0%

EXTINGUISHING MEDIA: FOAM, CO2, DRY CHEMICAL, WATER FOG

SPECIAL FIREFIGHTING PROCEDURES
NORMAL FIREFIGHTING PROCEDURES SHOULD BE USED. FIREFIGHTERS SHOULD WEAR SELF-CONTAINED BREATHING APPARATUS.

UNUSUAL FIRE AND EXPLOSION HAZARDS
EXPOSURE OF CLOSED CONTAINERS TO EXCESSIVE HEAT MAY CAUSE DISRUPTIVE PRESSURE. WATER SPRAY SHOULD BE USED TO KEEP CLOSED CONTAINERS COOL. PLASTIC CONTAINERS MAY MELT AND LEAK DURING A FIRE.

TOTAL ANNUAL COST SPREADSHEET PROGRAM–REGENERATIVE THERMAL OXIDIZERS

COST BASE DATE: December 1988 [1]

VAPCCI (Second Quarter 1998): [2] 106.2

INPUT PARAMETERS

-- Gas flowrate (scfm):	25000
-- Reference temperature (oF):	77
-- Inlet gas temperature (oF):	100
-- Inlet gas density (lb/scf):	0.0490
-- Primary heat recovery (fraction):	0.95
-- Waste gas heat content (BTU/scf):	0.50
-- Waste gas heat content (BTU/lb):	10.20
-- Gas heat capacity (BTU/lb-oF):	0.255
-- Combustion temperature (oF):	1600
-- Heat loss (fraction):	0.01
-- Exit temperature (oF):	175
-- Fuel heat of combustion (BTU/lb):	21502
-- Fuel density (lb/ft3):	0.0414

DESIGN PARAMETERS

Auxiliary Fuel Requirement (lb/min):		0.730
	(scfm):	17.64
Total Gas Flowrate (scfm):		25018

TOTAL CAPITAL INVESTMENT ($) [3]
(Cost correlations range: 5000 to 500,000 scfm)

@ 85 % heat recovery--base:	0.00
" " --escalated:	0.00
@ 95 % heat recovery--base:	1,130,204
" " --escalated:	1,312,722
-- Other (auxiliary equipment, etc.):	85,000

ANNUAL COST INPUTS

Operating factor (hr/yr):	8400
Operating labor rate ($/hr):	13.00
Maintenance labor rate ($/hr):	14.00
Operating labor factor (hr/sh):	0.50
Maintenance labor factor (hr/wk):	1.00
Electricity price ($/kwh):	0.0501
Natural gas price ($/mscf):	4.00
Annual interest rate (fraction):	0.070
Control system life (years):	10
Capital recovery factor:	0.1424
Taxes, insurance, admin. factor:	0.04
Pressure drop (in. w.c.):	20.0

ANNUAL COSTS

Item	Cost ($/yr)	Wt. Factor	W.F.(cond.)	
Operating labor	6,825	0.020	---	
Supervisory labor	1,024	0.003	---	
Maintenance labor	728	0.002	---	
Maintenance materials	728	0.002	---	
Natural gas	35,571	0.103	---	
Electricity	41,061	0.119	---	
Overhead	5,583	0.016		0.043
Taxes, insurance, administrative	55,909	0.161	---	
Capital recovery	199,004	0.574		0.736
Total Annual Cost	346,433	1.000		1.000

NOTES:

[1] Base total capital investment reflects this date.
[2] VAPCCI = Vatavuk Air Pollution Control Cost Index (for regenerative thermal oxidizers) corresponding to year and quarter shown. Base total capital investment has been escalated to this date via VAPCCI and control equipment vendor data.
[3] Source: Vatavuk, William M. ESTIMATING COSTS OF AIR POLLUTION CONTROL. Boca Raton, FL: Lewis Publishers, 1990.

TOTAL ANNUAL COST SPREADSHEET PROGRAM--STRAIGHT DUCTWORK [1]

COST BASE DATE: Second Quarter 1993 [2]

PPI (Third Quarter 1995): [3]	137.4

INPUT PARAMETERS

-- Inlet stream flowrate (acfm):		20000
-- Duct velocity (ft/min): [4]		1500
-- Duct length (ft): [5]		200
-- Material of construction: [6]		304 SS sh.
-- Insulation thickness (in.): (text input) [7]		1.00
-- Duct design: [8]		Circ.-long.
-- Cost equation parameters: [9]		
	a:	2.030
	b:	0.784
-- Cost equation form: [10]		1.00
-- Control system installation factor: [11] (if no system, enter '0')		1.50
-- Fan-motor combined efficiency (fraction):		0.60

DESIGN PARAMETERS

-- Duct diameter (in.):	49.4
-- Pressure drop (in. w.c.): [12]	0.106

CAPITAL COSTS

Equipment Cost ($)--base:	8,642
" " "--escalated:	9,491
Purchased Equipment Cost ($).	10,250
Total Capital Investment ($): [13]	15,376

ANNUAL COST INPUTS

Operating factor (hours/year):	8400
Electricity price ($/kWhr):	0.0501
Annual interest rate (fractional):	0.070
Ductwork economic life (years):	10
Capital recovery factor (system):	0.1424
Taxes, insurance, admin. factor:	0.04

ANNUAL COSTS

Item	Cost ($/yr)	Wt.Fact.
Electricity	175	0.059
Taxes, insurance, administrative	615	0.206
Capital recovery	2,189	0.735
Total Annual Cost	2,979	1.000

Notes:

[1] Data used to develop this program were taken from 'OAQPS Control Cost Manual', 4th edition, Chapter 10 (March 1994). Prices are for CIRCULAR straight ductwork, only.

[2] Base ductwork costs reflect this date.

[3] PPI = Producer Price Index PCU 3444#637 ('Air-conditioning ducts, including dust collecting ducts, steel') for year and quarter shown. Ductwork equipment cost has been escalated to this date via this PPI.

[4] See 'Manual,' pp. 10-30 to 10-33.

[5] Duct length is a site-specific parameter that can vary from < 10 to > 1000 ft.

[6] Choices available are: carbon steel sheet (galv. CS sh.) stainless steel sheet (304 SS sh.), coated carbon steel plate (coat. CS pl.), 304 stainless steel plate (304 SS pl.) polyvinyl chloride (PVC), and fiber-reinforced plastic (FRP)

[7] Choices are: 0, 1, and 3.

[8] Choices are: circular spiral (circ.-spiral) and circular longitudinal (circ.-long.)

[9] Equation type and parameters depend on duct material of construction. Parameters reflect 2nd quarter 1993 costs. See 'Manual,' pp. 10-44 to 10-49.

[10] Choices are: power function (1) and exponential (2).

[11] Installation factor depends on control device ductwork is supporting. This factor, when multiplied by Purchased Equipment Cost, yields Total Capital Investment (TCI). If ductwork is installed alone, factor is 1.25 to 1.50. (Default = 1.50.) See 'Manual'.

[12] Pressure drop applies ONLY to circular, spiral-wound galvanized duct with 10 joints per 100 feet. For pressure drop data for other duct types, see 'Manual,' Chapter 10.

[13] Product of installation factor and Purchased Equipment Cost. Costs are presented both in terms of 2nd quarter '93 and above escalation date. Latter costs are based on Producer Price Index PCU 3444#037 ('Air-conditioning ducts, including dust collecting ducts, steel')

TOTAL ANNUAL COST SPREADSHEET PROGRAM--GAS ABSORBERS [1]

COST BASE DATE: Third Quarter 1991 [2]

VAPCCI (Second Quarter 1996): [3] 108.2

INPUT PARAMETERS:

Stream parameters:

-- Inlet waste gas flowrate (acfm):	20000
-- Inlet waste gas temperature (oF):	100
-- Inlet waste gas pressure (atm.):	1.00
-- Pollutant in waste gas:	N-Propyl Alcohol
-- Inlet gas poll. conc., yi (mole fraction):	0.0002
-- Pollutant removal efficiency (fraction):	0.60
-- Solvent:	Water
-- Inlet pollutant conc. in solvent:	0.00
-- Waste gas molecular weight (lb/lb-mole):	28.00
-- Solvent molecular weight (lb/lb-mole):	18.0
-- Inlet waste gas density (lb/ft3):	0.0725
-- Solvent density (lb/ft3):	62.32
-- Solvent specific gravity:	1.00
-- Waste gas viscosity @ inlet temp. (lb/ft-hr):	0.043
-- Solvent viscosity @ inlet temp. (lb/ft-hr):	2.42
-- Minimum wetting rate (ft2/hr):	1.300
-- Pollutant diffusivity in air (ft2/hr):	0.725
-- Pollutant diffusivity in solvent (ft2/hr):	0.000102

Packing parameters:

-- Packing type:	1-in. Jaeger Tri-packs tower packing
-- Packing factor, Fp:	65.00
-- Packing constant, alpha:	3.82
-- Packing constant, beta:	0.41
-- Packing constant, gamma:	0.45
-- Packing constant, phi:	0.01
-- Packing constant, b:	0.22
-- Packing constant, c:	0.24
-- Packing constant, j:	0.17
-- Surface area-to-volume ratio, a (ft2/ft3):	28.00
-- Packing cost ($/ft3):	20.00

DESIGN PARAMETERS:

-- Material of construction (see list below):[4]	1.4
-- Inlet pollutant concentration (free basis):	2.00E-04
-- Outlet pollutant concentration (free basis):	0.00
-- Out. eq. poll. conc. in solv., Xo* (op. line):	0.16
-- Theoretical operating line slope (Ls/Gs,min.):	0.0008
-- Ls/Gs adjustment factor:	1.50
-- Actual operating line slope (Ls/Gs, act.):	0.0011
-- Gas flowrate, Gs (free basis, lb-moles/hr):	3107
-- Solvent flowrate, Ls (free basis, lb-mol/hr):	5790
-- Gas flowrate, Gmol,i (lb-moles/hr):	3107
-- Solvent flowrate, Lmol,i (lb-moles/hr):	5790
-- Outlet actual pollutant conc. in solv., Xo:	0.1067
-- Gas poll. conc. in eq. w/Xo (Yo*):	0.0001
-- Outlet solv. poll. conc. (mole fract. basis):	0.0964
-- Gas poll. conc., Yo* (mole fract. basis):	0.00
-- Outlet gas poll. conc., yo (mole fract.):	0.00
-- Slope of equilibrium line (m):	0.00
-- Absorption factor (AF):	1.08
-- ABSCISSA (column diameter calculation):	0.00
-- ORDINATE (column diameter calculation):	0.2061
-- Superficial gas flowrate, Gsfr,i (lb/sec-ft2)	0.6789
-- Flooding factor, f:	0.70
-- Column cross-sectional area, A (ft2):	50.85
-- Superficial liquid flowrate (lb/hr-ft2):	2049.74
-- Minimum liquid flowrate (lb/hr-ft2):	2268
-- Column diameter, D (ft2):	8.046
-- Number of transfer units, Ntu:	1.418
-- Gas film transfer coefficient, Hg (ft):	2.259
-- Liquid film transfer coefficient, Hl (ft):	1.099
-- Height of a transfer unit (ft):	3.273
-- Packing depth (ft):	4.641
-- Column total height (ft):	17.51
-- Column surface area (ft2):	544.4
-- Column gas pressure drop (in. w.c./ft packing):	0.957
-- Column liquid pressure drop (ft of H2O):	60
-- Packing volume (ft3):	236.0

CAPITAL COSTS:

Equipment costs ($):	
– Gas absorber	87,652
– Packing	4,720
– Total (base)	92,371
' (escalated)	105,003
– Other (auxiliary equipment, etc.):	85,000
Purchased Equipment Cost ($):	224,204
Total Capital Investment ($):	493,248

ANNUAL COST INPUTS:

Operating factor (hr/yr):	8400
Operating labor rate ($/hr):	13.00
Maintenance labor rate ($/hr):	14.00
Operating labor factor (hr/sh):	0.5
Maintenance labor factor (hr/sh):	0.5
Electricity price ($/kWhr):	0.0501
Caustic price ($/ton):	0
Solvent (water) price ($/1000 gal):	0.2
Wastewater trtmt cost ($/1000 gal):	1.73
Overhead rate (fraction):	0.6
Annual interest rate (fraction):	0.070
Control system life (years):	10
Capital recovery factor (system):	0.1424
Taxes, insurance, admin. factor:	0.04

ANNUAL COSTS:

Item	Cost ($/yr)	Wt. Factor	W.F.(cond.)
Operating labor	6,825	0.021	----
Supervisory labor	1,024	0.003	----
Maintenance labor	7,350	0.023	----
Maintenance materials	7,350	0.023	----
Electricity	7,809	0.024	----
Caustic	0	0.000	----
Solvent (water)	7,323	0.023	----
Wastewater treatment	181,659	0.563	----
Overhead	13,529	0.042	0.112
Taxes, insurance, administrative	19,730	0.061	----
Capital recovery	70,227	0.218	0.279
Total Annual Cost	322,827	1.000	1.000

NOTES:

[1] This program has been based on data and procedures in Chapter 9 of the OAQPS CONTROL COST MANUAL (4th edition).

[2] Base equipment costs reflect this date.

[3] VAPCCI = Vatavuk Air Pollution Control Cost Index (for gas absorbers) corresponding to year and quarter shown. Base equipment cost, purchased equipment cost, and total capital investment have been escalated to this date via the VAPCCI and control equipment vendor data.

[4] Enter one of the following: fiberglass-reinforced plastic (FRP)--'1' ; 304 stainless steel--'1.4'; polypropylene--'0.95'; polyvinyl chloride (PVC)--'0.70'.

PRESSROOM SCHEMATIC

SECTION V - REACTIVITY DATA

STABILITY: STABLE

CONDITIONS TO AVOID

AVOID HEAT, FIRE AND OPEN FLAME. KEEP FROM FREEZING.

INCOMPATIBILITY (MATERIALS TO AVOID)

AVOID CONTACT WITH STRONG ACIDS, ALKALIES AND OXIDIZING AGENTS

HAZARDOUS DECOMPOSITION OR BYPRODUCTS

THERMAL DECOMPOSITION MAY CREATE CARBON MONOXIDE AND OTHER TOXIC FUMES.

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

NONE WILL OCCUR

SECTION VI - HEALTH HAZARD DATA

INHALATION HEALTH RISKS AND SYMPTOMS OF EXPOSURE

PROLONGED BREATHING OF VAPORS CAN CAUSE HEADACHE, NAUSEA AND/OR NARCOSIS. OVEREXPOSURE BY INHALATION MAY LEAD TO IRRITATION OF LUNGS AND/OR RESPIRATORY TRACT.

SKIN AND EYE CONTACT HEALTH RISKS AND SYMPTOMS OF EXPOSURE

SKIN CONTACT MAY CAUSE IRRITATION, INCLUDING DRYNESS AND CRACKING OF THE SKIN. EYE CONTACT MAY CAUSE IRRITATION, INCLUDING REDNESS AND TEARING.

SKIN ABSORPTION HEALTH RISKS AND SYMPTOMS OF EXPOSURE

PROLONGED SKIN CONTACT MAY CAUSE IRRITATION, INCLUDING DRYNESS AND CRACKING OF THE SKIN.

INGESTION HEALTH RISKS AND SYMPTOMS OF EXPOSURE

INGESTION MAY CAUSE IRRITATION TO THE THROAT AND INTESTINAL TRACT, AND MAY CAUSE NAUSEA, DIARRHEA OR VOMITING.

HEALTH HAZARDS (ACUTE AND CHRONIC)

ACUTE: REDNESS, DRYNESS AND CRACKING OF THE SKIN. IRRITATION OF THE THROAT, LUNGS, NOSE AND RESPIRATORY SYSTEM. REDNESS AND TEARING OF THE EYES.
CHRONIC: NONE KNOWN.

CARCINOGENICITY: NTP? NO IARC MONOGRAPHS? NO OSHA REGULATED? NO

NOT APPLICABLE.

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE

PREEXISTING EYE, SKIN OR RESPIRATORY DISORDERS MAY BE AGGRAVATED BY EXPOSURE TO THIS PRODUCT.

EMERGENCY AND FIRST AID PROCEDURES

FOR INHALATION: REMOVE TO FRESH AIR. CALL A PHYSICIAN.
FOR SKIN CONTACT: WASH THOROUGHLY WITH SOAP AND WATER. USE A SUITABLE HAND CREAM.
FOR EYE CONTACT: FLUSH WITH PLENTY OF WATER. IF IRRITATION PERSISTS, CONSULT A PHYSICIAN.
FOR INGESTION: CONTACT A PHYSICIAN IMMEDIATELY.

SECTION VII - PRECAUTIONS FOR SAFE HANDLING AND USE

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

REMOVE ALL SOURCES OF IGNITION. VENTILATE AREA. DIKE SPILL AREA AND ABSORB USING A SUITABLE ABSORBENT MATERIAL

WASTE DISPOSAL METHOD

DISPOSE OF IN ACCORDANCE WITH ALL APPLICABLE LOCAL, STATE AND FEDERAL REGULATIONS. EMPTY CONTAINERS MAY CONTAIN PRODUCT RESIDUE. DISPOSE OF EMPTY CONTAINERS IN ACCORDANCE WITH ALL APPLICABLE REGULATIONS.

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING

KEEP CONTAINERS CLOSED WHEN NOT IN USE. KEEP ALL FOUNTAINS, ROLLER TRAINS AND PUMP CONTAINERS COVERED TO PREVENT EVAPORATION OF THE VOLATILE PORTION OF PRODUCT. STORE AWAY FROM SOURCES OF OPEN FLAME OR EXCESSIVE HEAT. DO NOT STORE IN DIRECT SUNLIGHT. KEEP FROM FREEZING. STORE IN WELL-VENTILATED AREA.

OTHER PRECAUTIONS

AVOID PROLONGED BREATHING OF FUMES OR VAPORS. AVOID EYE CONTACT OR PROLONGED SKIN CONTACT. WASH HANDS AND FACE AFTER USING THIS PRODUCT, ESPECIALLY BEFORE EATING OR SMOKING. THIS PRODUCT IS NOT FORMULATED FOR USE WHERE IT MIGHT BECOME A FOOD ADDITIVE.

SECTION VIII - CONTROL MEASURES

RESPIRATORY PROTECTION

AS NEEDED TO PREVENT INHALATION OF VAPORS IN EXCESS OF THE TLV

VENTILATION

GENERAL VENTILATION WITH MINIMUM RATE OF ONE CUBIC FOOT PER MINUTE PER SQUARE FOOT OF FLOOR AREA, INCLUDING PITS, WHERE FLAMMABLE VAPORS MAY ACCUMULATE.

PROTECTIVE GLOVES

PROTECTIVE GLOVES SHOULD BE WORN WHERE PROLONGED SKIN CONTACT MAY OCCUR.

EYE PROTECTION

PROTECTIVE GLASSES OR GOGGLES SHOULD BE WORN TO PREVENT SPLASHING INTO THE EYES.

OTHER PROTECTIVE CLOTHING OR EQUIPMENT

AS DEEMED NECESSARY.

WORK/HYGIENIC PRACTICES

WASH HANDS AND FACE THOROUGHLY AFTER USING THIS PRODUCT, ESPECIALLY BEFORE EATING OR SMOKING.

SECTION IX - DISCLAIMER

DISCLAIMER

YOU SHOULD CONSIDER THE ASSISTANCE OF INDIVIDUALS TRAINED IN THE PROPER EVALUATION OF HEALTH-RELATED DATA. WHILE THE DAW INK COMPANY BELIEVES THAT THE DATA SET FORTH IN THIS SHEET IS ACCURATE, THE DAW INK COMPANY MAKES NO WARRANTY WITH RESPECT THERETO AND EXPRESSLY DISCLAIMS ALL LIABILITY FOR RELIANCE THEREON.

MATERIAL SAFETY DATA SHEET

PRODUCT NAME: HYDROTECH 760 SER #476C BROWN HMIS CODES: H F R P
PRODUCT CODE: CW-3100 1 1 0 B

SECTION I - MANUFACTURER IDENTIFICATION

MANUFACTURER'S NAME: A.J. DAW PRINTING INK CO., INC.
ADDRESS: 3559 S. GREENWOOD AVENUE, LOS ANGELES, CA 90040
EMERGENCY PHONE: (800)424-9300 INFORMATION PHONE: (213)723-3253
DATE REVISED : 06-17-92 NAME OF PREPARER : REX R. TAMM
REASON REVISED : EXEMPTION OF PHTHALOCYANINE PIGMENTS FROM SARA 313 REPORTING

SECTION II - HAZARDOUS INGREDIENTS/SARA III INFORMATION

HAZARDOUS COMPONENTS	CAS NUMBER	OCCUPATIONAL EXPOSURE LIMITS OSHA PEL	ACGIH T.V	ADD'L INFO	VAPOR PRESSURE mm Hg @ TEMP		WEIGHT PERCENT
ISOPROPYL ALCOHOL	67-63-0	400 PPM	400 PPM	FLAMMABLE	33.0	68	5
AMMONIA, ANHYDROUS	7664-41-7	50 PPM	25 PPM	CORROSIVE	6460.0	68F	2
CARBON BLACK	1333-86-4	3.5 MG/M3	3.5 MG/M3		N/A		< 5.0%
TITANIUM DIOXIDE	13463-67-7	15 MG/M3	10 MG/M3	DUST HAZRD	N/A		5.0%
PROPY. ALCOHOL; n-PROPANOL	71-23-8	200 PPM	200 PPM	FLAMMABLE	14.0	68F	5.0%

* Indicates toxic chemical(s) subject to the reporting requirements of section 313 of Title III and of 40 CFR 372.

SECTION III - PHYSICAL/CHEMICAL CHARACTERISTICS

BOILING POINT: 212 FSPECIFIC GRAVITY (H2O=1): 1.0
VAPOR DENSITY: HEAVIER THAN AIR EVAPORATION RATE: SLOWER THAN ETHER
COATING V.O.C. : 1.76 LB/GL (211 G/L)
MATERIAL V.O.C.: 0.77 LB/GL (93 G/L)
SOLUBILITY IN WATER: SOLUBLE
APPEARANCE AND ODOR: COLORED LIQUID; AMMONIACAL ODOR

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: OVER 140F METHOD USED: CC
FLAMMABLE LIMITS IN AIR BY VOLUME- LOWER: 2.0% UPPER: 27.0%

EXTINGUISHING MEDIA: FOAM, CO2, DRY CHEMICAL, WATER FOG

SPECIAL FIREFIGHTING PROCEDURES
NORMAL FIREFIGHTING PROCEDURES SHOULD BE USED. FIREFIGHTERS SHOULD WEAR SELF-CONTAINED BREATHING APPARATUS.

UNUSUAL FIRE AND EXPLOSION HAZARDS
EXPOSURE OF CLOSED CONTAINERS TO EXCESSIVE HEAT MAY CAUSE DISRUPTIVE PRESSURE. WATER SPRAY SHOULD BE USED TO KEEP CLOSED [illegible] PLASTIC CONTAINERS MAY MELT AND LEAK DURING A FIRE.

SECTION V - REACTIVITY DATA

STABILITY: STABLE

CONDITIONS TO AVOID

AVOID HEAT, FIRE AND OPEN FLAME. KEEP FROM FREEZING.

INCOMPATIBILITY (MATERIALS TO AVOID)

AVOID CONTACT WITH STRONG ACIDS, ALKALIES AND OXIDIZING AGENTS

HAZARDOUS DECOMPOSITION OR BYPRODUCTS

THERMAL DECOMPOSITION MAY CREATE CARBON MONOXIDE AND OTHER TOXIC FUMES

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

[illegible] WILL OCCUR

SECTION VI - HEALTH HAZARD DATA

INHALATION HEALTH RISKS AND SYMPTOMS OF EXPOSURE

PROLONGED BREATHING OF VAPORS CAN CAUSE HEADACHE, NAUSEA AND/OR NARCOSIS. OVEREXPOSURE BY INHALATION MAY LEAD TO IRRITATION OF LUNGS AND/OR RESPIRATORY TRACT

SKIN AND EYE CONTACT HEALTH RISKS AND SYMPTOMS OF EXPOSURE

SKIN CONTACT MAY CAUSE IRRITATION, INCLUDING DRYNESS AND CRACKING OF THE SKIN. EYE CONTACT MAY CAUSE IRRITATION, INCLUDING REDNESS AND TEARING.

SKIN ABSORPTION HEALTH RISKS AND SYMPTOMS OF EXPOSURE

PROLONGED SKIN CONTACT MAY CAUSE IRRITATION, INCLUDING DRYNESS AND CRACKING OF THE SKIN.

INGESTION HEALTH RISKS AND SYMPTOMS OF EXPOSURE

INGESTION MAY CAUSE IRRITATION TO THE THROAT AND INTESTINAL TRACT, AND MAY CAUSE NAUSEA, DIARRHEA OR VOMITING.

HEALTH HAZARDS (ACUTE AND CHRONIC)

ACUTE: REDNESS, DRYNESS AND CRACKING OF THE SKIN. IRRITATION OF THE THROAT, LUNGS, NOSE AND RESPIRATORY SYSTEM. REDNESS AND TEARING OF THE EYES.

CHRONIC: NONE KNOWN.

CARCINOGENICITY: NTP? NO IARC MONOGRAPHS? NO OSHA REGULATED? NO

N/A - NOT KNOWN.

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE

PREEXISTING EYE, SKIN OR RESPIRATORY DISORDERS MAY BE AGGRAVATED BY EXPOSURE TO THIS PRODUCT

EMERGENCY AND FIRST AID PROCEDURES

FOR INHALATION: REMOVE TO FRESH AIR. CALL A PHYSICIAN.

FOR SKIN CONTACT: WASH THOROUGHLY WITH SOAP AND WATER. USE A SUITABLE HAND CREAM.

FOR EYE CONTACT: FLUSH WITH PLENTY OF WATER. IF IRRITATION PERSISTS, CONSULT A PHYSICIAN.

FOR INGESTION: CONTACT A PHYSICIAN IMMEDIATELY.

SECTION VII - PRECAUTIONS FOR SAFE HANDLING AND USE

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

REMOVE ALL SOURCES OF IGNITION. VENTILATE AREA. DIKE SPILL AREA AND ABSORB USING A SUITABLE ABSORBENT MATERIAL.

WASTE DISPOSAL METHOD

DISPOSE OF IN ACCORDANCE WITH ALL APPLICABLE LOCAL, STATE AND FEDERAL REGULATIONS. EMPTY CONTAINERS MAY CONTAIN PRODUCT RESIDUE. DISPOSE OF EMPTY CONTAINERS IN ACCORDANCE WITH ALL APPLICABLE REGULATIONS.

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING

KEEP CONTAINERS CLOSED WHEN NOT IN USE. KEEP ALL FOUNTAINS, ROLLER TRAINS AND PUMP CONTAINERS COVERED TO PREVENT EVAPORATION OF THE VOLATILE PORTION OF PRODUCT. STORE AWAY FROM SOURCES OF OPEN FLAME OR EXCESSIVE HEAT. DO NOT STORE IN DIRECT SUNLIGHT. KEEP FROM FREEZING. STORE IN WELL VENTILATED AREA.

OTHER PRECAUTIONS

AVOID PROLONGED BREATHING OF FUMES OR VAPORS. AVOID EYE CONTACT OR PROLONGED SKIN CONTACT. WASH HANDS AND FACE AFTER USING THIS PRODUCT, ESPECIALLY BEFORE EATING OR SMOKING. THIS PRODUCT IS NOT FORMULATED FOR USE WHERE IT MIGHT BECOME A FOOD ADDITIVE.

SECTION VIII - CONTROL MEASURES

RESPIRATORY PROTECTION

WHEREDED TO PREVENT INHALATION OF VAPORS IN EXCESS OF THE TLV.

VENTILATION

GENERAL VENTILATION WITH MINIMUM RATE OF ONE CUBIC FOOT PER MINUTE PER SQUARE FOOT OF FLOOR AREA, INCLUDING PITS, WHERE FLAMMABLE VAPORS MAY ACCUMULATE.

PROTECTIVE GLOVES

PROTECTIVE GLOVES SHOULD BE WORN WHERE PROLONGED SKIN CONTACT MAY OCCUR.

EYE PROTECTION

PROTECTIVE GLASSES OR GOGGLES SHOULD BE WORN TO PREVENT SPLASHING INTO THE EYES.

OTHER PROTECTIVE CLOTHING OR EQUIPMENT

AS DEEMED NECESSARY.

WORK/HYGIENIC PRACTICES

WASH HANDS AND FACE THOROUGHLY AFTER USING THIS PRODUCT, ESPECIALLY BEFORE EATING OR SMOKING.

SECTION IX - DISCLAIMER

DISCLAIMER

YOU SHOULD CONSIDER THE ASSISTANCE OF INDIVIDUALS TRAINED IN THE PROPER EVALUATION OF HEALTH RELATED DATA. WHILE THE DAW INK COMPANY BELIEVES THAT THE DATA SET FORTH IN THIS SHEET IS ACCURATE, THE DAW INK COMPANY MAKES NO WARRANTY WITH RESPECT THEREIO AND EXPRESSLY DISCLAIMS ALL LIABILITY FOR RELIANCE THEREON.

EXAMPLE OF AFTERBURNER SALES QUOTE

MEGTEC Systems
830 Prosper Road
P.O. Box 5030
De Pere, WI 54115-5030

920/336-5715

15 September, 1997

Mr. Don O'Malley
Formel Industries
2355 North 25th Street
Franklin Park, IL 60131

Reference: MEGTEC Systems Budgetary Proposal No. 108420

Dear Mr. O'Malley:

Enclosed please find our proposal 108420 for one MAGNUM® 8,500 scfm catalytic oxidizer for your facility on 25th street. For the past few months, I have been looking for a used system in this size and the only one I was able to find was the thermal oxidizer we talked about. For that unit , they want about $ 215,000 and the operating gas cost would be roughly three times higher than with a MAGNUM catalyiic unit. As I noted in our talks on Friday, we can provide a fully installed system at your facility for less than $ 350,000.

I asked the personnel at Consolidated Capital in the Milwaukee area to contact you regarding the various options available to you through leasing programs. Leasing offers you the ability to install a new system that will keep the environmental authorities away from your door and at the same time you can put together a plan that will fit your budget.

While you will probably note that our name has changed from Grace TEC Systems to MEGTEC, the only difference is in the name. The same experienced people and performance guarantees are here to allow you to exceed all the requirements of the IL EPA. As you look around the flexographic community in northern Illinois, you will see our systems installed on both large and small facilities. Even the state personnel refer people to us for information on regulations and equipment. We can offer our annual maintenance program to have one of our technicians visit your facility annually and do the maintenance on the oxidizer, so your employees can concentrate on the subject of printing.

Should you want to discuss this proposal or if I can be of any service to you, please contact me at (920) 339-2789 at your convenience.

Sincerely,
MEGTEC SYSTEMS
Industrial Emission Control Products

Steven E. Rach
Senior Account Executive

SER:tlv.08420L1_

cc: Christine Roland, Inside Sales Representative - MEGTEC Systems

MEGTEC Systems
830 Prosper Road
P.O. Box 5030
De Pere, WI 54115-5030

920/336-5715

MAGNUM® - 085-70-6-C

Prepared For:

Mr. Don O'Malley
Formel Industries
2355 North 25th Street
Franklin Park, IL 60131

September 15, 1997

MEGTEC SYSTEMS
830 Prosper Road
De Pere, WI 54115
800-873-8458
Fax: 414-337-1585

Prepared by:

Steven E. Rach
Senior Account Executive

Budgetary Proposal No. 108420

EXECUTIVE SUMMARY

September 15, 1997

Mr. Don O'Malley
Formel Industries
2355 North 25th Street
Franklin Park, IL 60131

Dear Mr. O'Malley:

Enclosed please find our Budgetary Proposal No. 108420 for one (1) MEGTEC Systems **MAGNUM®-085-70-6-C (8,500 scfm)** catalytic oxidizer. This product has developed a reputation as the premiere oxidizers available for industrial VOC emission control. As you review the various offerings for this proposal, you will be looking for why one organization is better for your company than others. We feel that MEGTEC Systems offers the following real advantages which may not be clearly called out in other company's proposals:

A **Full Service Organization** is one that can offer a number of technologies based upon your needs and processes. MEGTEC Systems has been building oxidation systems since 1971 and has over 2,200 systems in operation world-wide. MEGTEC Systems offers thermal and catalytic recuperative, plus thermal regenerative oxidizers. This diverse offering of oxidizer technologies allows us to be able to recommend the *best* technology for your application.

Experience is that factor that separates those companies which "think" they can satisfy your environmental needs from those who "know" they can. Not only do we have a great deal of oxidizer experience, but this experience is enhanced by our being the world's largest manufacturer of web drying equipment, with over 6,500 systems in the field. This expertise is not only that of an oxidizer and dryer manufacturer, but is really based upon a core expertise in air heating and handling. Our experience also is in the people of MEGTEC Systems who number over 650 in our world headquarters in De Pere, Wisconsin. Here in our 390,000 square foot facility, we are designing and shipping over five systems (drying and oxidizers) per week! **Experience** is having a dedicated oxidation technology engineering group of 32 people who only work on oxidation equipment. **Experience** is having an in-house Research and Development department dedicated to developing the latest technologies in catalysis and oxidation innovation. **Experience** in oxidation technologies is synonymous with MEGTEC Systems!

Thank you for the opportunity to propose this equipment. If you have any questions or comments, please contact me at your convenience.

Regards,
MEGTEC SYSTEMS

Steven E. Rach
Senior Account Executive

SER.085prop_:tlv.08420B__

cc: Christine Roland, Inside Sales Representative - MEGTEC Systems

PROCESS CONDITIONS

The MAGNUM -085-70-6-C Catalytic Oxidation System is designed to operate with the following Flexographic printing processes.

Source	Flow Rate	Exhaust Temp	Solvent Load Nominal	Solvent Load Maximum
Kidder 660	2,500 *	120 ° F	30 lbs/hr	60 lbs/hr
Kidder 660	2,500 *	120 ° F	30 lbs/hr	60/lbs/hr
Future	3,500	120 ° F		

* Flow rate after recirculation is added.

Source	Solvent Types (% by weight)	Heating Value
Five Color Kidder 660	Alcohols & Acetates	13,500 Btu/lb
Five Color Kidder 660	Alcohols & Acetates	13,500 Btu/lb

Process Temperature (average)	120 °F
Solvent Usage	60 lbs/hr

- Maximum air flow (oxidizer) 8,500 SCFM
- Maximum Solvent Load (@ 13,500 Btu/lb) 350 lbs/hr
- Maximum Burner Capacity 3,672,000 Btu/hr
- Natural gas pressure requirement 1.5-5.0 PSIG
- Installed electrical requirement 47 KVA
- System fan motor horsepower 40 HP
- Combustion blower motor horsepower 5 HP
- Electrical service required (+5-10%) 460/3/60
- Heat exchanger effectiveness 70%

EQUIPMENT RECOMMENDATION

The **MAGNUM** Catalytic Oxidizer is designed with an integral stainless steel heat exchanger to improve operating efficiency. Designed for an operating temperature of 500 - 650° F, this unit is guaranteed to provide 98% hydrocarbon destruction efficiency for all worldwide codes. Applications for this unit include destruction of solvent vapors from coating, laminating, flexographic/heatset web offset/rotogravure printing, wood finishing, bakeries, and many other processes where catalyst poisons or masking agents are not present.

The **MAGNUM** incorporates a heat exchanger, catalyst bed, and line burner within a stainless steel enclosure surrounded by insulation and external aluminum cladding. An adjoining platform is available to support the main fan and combustion air blower. All internal joints are welded to eliminate any leakage of fumes or vapors. A prewired electrical tie off box with a terminal strip, and gas train is mounted to the side of the oxidizer enclosure for ease of shipping and installation.

The system fan pushes the VOC-laden through the cold-side inlet of the heat exchanger. The heat exchanger preheats the VOC laden air, which is then ducted to the line burner raising the temperature to the operating set point. The air enters the catalyst beds where conversion of the solvent into carbon dioxide and water vapor takes place. This reaction also causes heat release to occur raising the air temperature from the catalyst bed. The hot clean air enters the hot side of the heat exchanger, where it gives up thermal energy to preheat the incoming VOC-laden process air. The clean air from the heat exchanger exits the oxidizer through the exhaust stack. When high temperatures (due to high VOC loading) from the heat exchanger result in the air leaving the exchanger at temperatures above the unit set point, an automatic bypass damper will duct some process air around the exchanger and automatically control the temperature to the catalyst bed. Under this condition, the burner will shut off and the system will operate in a "self-sustaining" mode. An optional hotside bypass system is available for control of the charnber temperature when very high, continuous solvent loading is projected from the process.

BENEFITS AND FEATURES

The **MAGNUM 085-70-6-C Catalytic Oxidation System** is designed with the following benefits:

- **98% VOC DESTRUCTION GUARANTEE FOR ONE (1) YEAR**
- **MAXIMUM RELIABILITY PROVIDED & SUPPORTED BY:**
  - 4 year catalyst warranty
  - 4 year heat exchanger warranty
  - 1 year parts, labor, all-expenses warranty
- **MAXIMUM ENERGY EFFICIENCY PROVIDED:**
  - 70% Effectiveness integral heat exchanger
  - MEGTEC Systems 936 bead catalyst
  - Automatically varies system volume flows during idle operation or as processes come on or off line.
  - TEFC high efficiency motors
- **SYSTEM INTEGRATION WITH PROCESSES:**
  - Two (2) positive side three bladed uninsulated T-dampers to isolate each process from oxidation system
  - Purge-idle damper allows independent purge/start-up/idle operation of oxidation system, provides added volume when the flow falls below the minimum oxidizer volumetric turndown and provides temperature control during high solvent loading conditions.
  - Volume control from processes with modulating damper provides uniform flow from all processes and prevents over-exhausting the oxidizer.
- **PROJECT ASSISTANCE**
  - Permitting information regarding **MAGNUM** oxidizer can be provided, although permits and fees will remain the customer's responsibility
  - Project engineer will be assigned to work with your company. Submission of data to you for your insurance carrier.

BILL OF MATERIAL

SUMMARY MECHANICAL BILL OF MATERIAL

- Enclosure
- Heat Exchanger
- Burner
- System fan
- Combustion blower
- Inter-connecting ductwork
- Dampers
- Control box/faceplate
- Electrical cabinet
- Dilution and make-up air controller
- 6-Point chart recorder
- Accommodation of local codes and requirements
- Operator Manuals

OPERATING COSTS

MEGTEC SYSTEMS 936 CATALYST

Flow (scfm)	VOC (lbs./hr.)	Electrical ($/hr.)	Natural Gas ($/hr.)	Total ($/hr.)
Idle	-0-	$ 0.76	$ 1.80	$ 2.56
2,500	30	$ 0.81	$ 0.26*	$ 2.06
2,500	60	$ 0.88	$ 0.00	$ 0.88
5,000	60	$ 1.13	$ 0.85	$ 1.98
5,000	120	$ 1.23	$ 0.00	$ 1.23

* Denotes where burner will be cycling on and off during this condition.

The above fuel consumption values Include burner efficiency and thermal radiation. These estimates were calculated using a standard cost for utilities estimated at $.45 per therm for natural gas and $0.045 per kW for electrical cost and will need to be adjusted for actual utilities cost. As process solvents increase, natural gas consumption declines.

INSTALLATION

The **MAGNUM 085-70-6-C Catalytic Oxidation System** proposed herein can be installed by a MEGTEC authorized installation contractor through MEGTEC Systems. The following installation section of this proposal is based on the visit to your facility by our Mr. Scott Duff and regional installation personnel. The installation scope includes;

- **CONCRETE AND STRUCTURAL:**
  - Manufacturer and install structural steel frame to support MAGNUM on the roof of your building.
  - Paint all steel members.
  - Concrete footings are not included as contractor does not anticipate being required.
- **RIGGING AND ERECTION:**
  - Unload and set catalytic oxidizer chamber.
  - Unload and set fan/motor platform assembly.
  - Unload and install miscellaneous parts as supplied by MEGTEC
  - Assemble sections together and secure to structural supports.
- **ENGINEERING AND INSTALLATION OF DUCT SYSTEM:**
  - Fabricate ductwork designed for +/- 15" W.C. per S.M.A.C.N.A. with flanged construction for two existing flexo presses.
  - Delivery of ductwork to jobsite.
  - Install two T-dampers from MEGTEC on the positive side of the existing exhaust stacks.
  - Install ductwork from existing ductwork to oxidizer including installation of MEGTEC purge/idle damper.
  - Supply and install exhaust stack on discharge of the MAGNUM.
  - Ductwork support will be supplied on roof.
  - Furnish and install all required traverse points at T-dampers, inlet of system fan, and outlet of fan.
  - Install openings for photohelic lines, pressure sensing lines, and thermocouples.
  - Install recirculation ductwork to reduce existing flows to final flow of roughly 2,500 scfm per press.
- **INSTALLATION OF PIPING:**
  - Connect onto valved gas main located within 10 foot of connection point for supply to MAGNUM unit.
  - All gas piping will be done in accordance with local city code and meet B.O.C.A. specifications..

INSTALLATION (Continued)

- **ELECTRICAL INSTALLATION:**
  - Provide all electrical wiring from MEGTEC control cabinet to oxidizer and dampers.
  - Furnish and install all conduit and wiring from MAGNUM to the controller.
  - Wire two T-dampers.
  - Wire from MAGNUM cabinet to press interlocks.
  - Wire duct pressure transmitter.
  - Wire thermocouples.
  - All exterior conduit will be I.M.C. threaded conduit.
  - All work will be done to National Electrical Code specifications.

BY OTHERS

- **While our installation package has been put together as complete as possible, there are a number of areas that need to be provided by others as noted below:**
  - Natural gas needs to be supplied at adequate pressure and volume to within ten feet of the oxidizer connection point.
  - Power needs to be supplied to within 10 feet of the electrical oxidizer cabinet.
  - Permits as required.
  - Electrical roof penetrations.

PRICE, TERMS AND DELIVERY

- **PRICE**

One (1) **MAGNUM** 085-70-6-C Catalytic Oxidation System	$ 226,075
Shipping	$ 3,200
Installation	$ 115,000
Start-up	$ 5,000
Total Price	$ 349,275

- **TERMS**

Purchase orders should be made out to MEGTEC Systems.

30% with purchase order
30% 60 days prior to shipment
30% upon notification of shipment
10% of purchase price upon equipment compliance test not to exceed 90 days from shipment

- **DELIVERY**

This equipment can be manufactured and ready for shipment 12 - 14 weeks from the receipt of your purchase order and down-payment. If this system is required in a shorter time period, please contact us.