Pollution Prevention and Finance

NATIONAL POLLUTION PREVENTION CENTER FOR HIGHER EDUCATION

Crotalus Circuits

This case was written by Professor Mark White of the University of Virginia's McIntire School of Commerce as a basis for class discussion, rather than to illustrate either effective or ineffective handling of an administrative situation. The author gratefully acknowledges the helpful advice of Mike Atchison and Greg Pitts. Financial support was provided by the National Pollution Prevention Center for Higher Education.

It was an unseasonably mild day in Rochester, Michigan, during February 1997 as Henry Dean, a lending officer with Rochester National Bank, wrinkled his brow with concern. The day's mail had brought copies of Crotalus Circuits' most recent financial statements, informing him of a loss the firm had incurred during the past year. He had not yet responded to a voicemail message he'd received last week from Crotalus' president, Grant Sawyer, inquiring about the possibility of increasing his firm's loan balance with the bank. Moreover, the content of Grant's message — it mentioned something about formaldehyde and cancer — made Dean uneasy.

Company Background

Crotalus Circuits' primary product was printed wire boards (PWBs) used in the manufacture of small appliances, telecommunication devices and computer devices. In 1986, Grant Sawyer (an electrical engineer) and his two brothers purchased a 34,000-square-foot former paint factory and began making simple wire boards for a local automotive supplier. Shortly thereafter they formed a corporation, over which they maintain a controlling interest. After a rocky start, the firm achieved notable success, almost doubling its sales and asset base from 1992 to 1995 (**Exhibit 1** and **Exhibit 2**). This past year, Crotalus incurred a $155,000 loss due to poor market demand and greater-than-expected administrative costs. The firm also experienced its first visit from the U.S. Environmental Protection Agency (EPA). In June 1996, a disgruntled worker notified the Agency about alleged irregularities in the transport and handling of formaldehyde, a catalyst used in the manufacture of PWBs. Dealing with the resulting negative press and increased regulatory scrutiny had taken up substantial amounts of Sawyer's time. Crotalus produces approximately 350,000 surface square feet (ssf) of printed wire boards annually.

Printed Wire Boards

Printed wire boards are essentially a commodity product. The industry is characterized by significant competition, relatively low barriers to entry, and a high degree of fragmentation. Successful firms have generally differentiated themselves in terms of innovation (a risky strategy), customer service focus, or cost-cutting abilities. On-time delivery and product quality are of paramount importance in this industry.

The first step in creating a printed wire board is to design or acquire the circuitry patterns. For the most part, Crotalus manufactures to end-user specifications, but does some in-house design as well. The overall process is called "electroless plating" and is a purely chemical process using formaldehyde as the reducing agent (**Exhibit 3**). To begin, circuit designs are applied to the boards in a series of steps involving numerous baths in chemical catalysts, cleaners, and etching solutions. The inner layers are then laminated together and a precise series of holes are drilled allowing for conduction between the layers. After the outer layer is applied, the boards receive their final finish. The process is very time-consuming and generates significant quantities of wastewater and spent chemicals (**Exhibit 4**).

EXHIBIT 1: CROTALUS CIRCUITS ANNUAL INCOME STATEMENTS, $ THOUSANDS

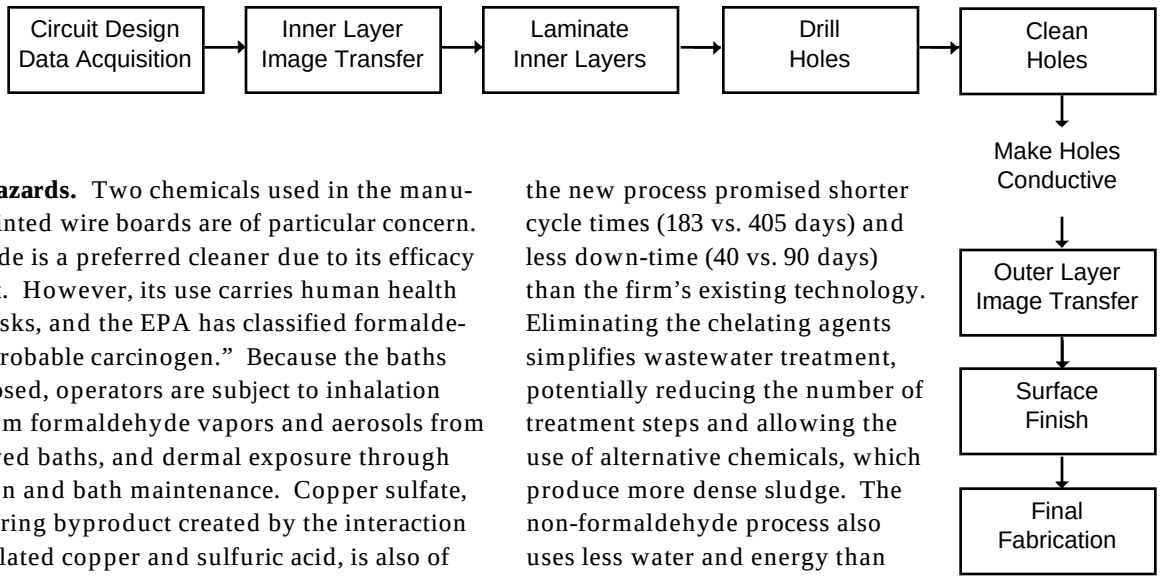
	Dec-96	Dec-95	Dec-94	Dec-93	Dec-92
Sales	$9,940	$13,128	$10,315	$8,523	$7,440
- Cost of Goods Sold	(6,242)	(9,071)	(7,174)	(5,931)	(5,240)
Gross Profit	3,698	4,057	3,141	2,592	2,200
- Selling Expense	(2,820)	(1,707)	(1,393)	(1,247)	(1,170)
EBITDA	878	2,350	1,748	1,345	1,030
- Depreciation, Depletion and Amortization	(904)	(756)	(665)	(617)	(610)
Operating Profit (EBIT)	(26)	1,594	1,083	728	420
- Interest Expense	(108)	(69)	(58)	(55)	(57)
+/- Non-operating Expense	111	94	17	23	6
Earnings Before Tax	(23)	1,619	1,042	696	369
- Total Income Tax	(23)	(531)	(351)	(220)	(122)
Income w/o Extraord. Items & Discont'd Oper'ns	(46)	1,088	691	476	247
+/- Extraordinary Items	0	0	0	4	0
+/- Discontinued Operations	(109)	0	0	0	0
Adjusted Net Income	($155)	$1,088	$691	$480	$247

EXHIBIT 2: CROTALUS CIRCUITS ANNUAL BALANCE SHEETS, $ THOUSANDS

ASSETS	**Dec-96**	**Dec-95**	**Dec-94**	**Dec-93**	**Dec-92**
Cash & Equivalents	$978	$1,553	$1,290	$888	$859
Net Receivables	$1,799	$2,320	$1,442	$1,218	$975
Inventories	$703	$1,135	$882	$822	$734
Prepaid Expenses	$50	$57	$66	$55	$58
Other Current Assets	$924	$453	$337	$331	$0
Total Current Assets	$4,454	$5,518	$4,017	$3,314	$2,626
Property, Plant & Equipm'nt	$6,712	$5,631	$4,895	$4,620	$4,434
- Accumulated Depreciation	($2,550)	($2,444)	($2,327)	($2,417)	($2,301)
Net Prop'y, Plant & Equip't	$4,162	$3,187	$2,568	$2,203	$2,133
Other Assets	$744	$510	$404	$476	$426
Total Assets	$9,360	$9,215	$6,989	$5,993	$5,185

CLAIMS	**Dec-96**	**Dec-95**	**Dec-94**	**Dec-93**	**Dec-92**
Current Portion of LT Debt	$15	$13	$12	$211	$16
Notes Payable	$299	$14	$0	$0	$38
Accounts Payable	$775	$1,110	$678	$543	$459
Taxes Payable	$163	$170	$56	$120	$93
Accrued Expenses	$1,234	$1,881	$1,248	$980	$885
Other Current Liabilities	$0	$0	$205	$147	$174
Total Current Liabilities	$2,486	$3,188	$2,199	$2,001	$1,665
Long Term Debt	$1,697	$804	$808	$694	$909
Investment Tax Credit	$0	$0	$0	$0	$219
Other Liabilities	$1,080	$1,128	$943	$983	$664
Common Stock	$190	$190	$93	$91	$83
Capital Surplus	$1,116	$1,081	$1,041	$932	$770
Retained Earnings	$2,803	$2,836	$1,911	$1,297	$879
Less: Treasury Stock	($12)	($12)	($6)	($5)	($4)
Common Equity	$4,097	$4,095	$3,039	$2,315	$1,728
Total Claims	$9,360	$9,215	$6,989	$5,993	$5,185

EXHIBIT 3: TYPICAL PROCESS FLOW FOR PWB MANUFACTURE



Chemical Hazards. Two chemicals used in the manufacture of printed wire boards are of particular concern. Formaldehyde is a preferred cleaner due to its efficacy and low cost. However, its use carries human health and safety risks, and the EPA has classified formaldehyde as a "probable carcinogen." Because the baths are not enclosed, operators are subject to inhalation exposure from formaldehyde vapors and aerosols from the air-sprayed baths, and dermal exposure through line operation and bath maintenance. Copper sulfate, a manufacturing byproduct created by the interaction between chelated copper and sulfuric acid, is also of concern. It is highly toxic to aquatic life and must be removed from Crotalus' wastewater prior to that wastewater's disposal in the nearby Paint River. Crotalus has a discharge permit allowing a fixed amount of copper in its wastewater. The firm exceeded this figure on one occasion, resulting in a minor fish kill. Several other manufacturing chemicals used by Crotalus (sulfuric acid, ethylene glycol, ethanolamine) also pose health and / or environmental risks.

Alternative Technologies. Several alternatives to electroless copper plating have been developed in recent years. Sawyer was particularly intrigued by a new non-formaldehyde electroless copper process. In addition to the obvious health / safety / environmental benefits, the new process promised shorter cycle times (183 vs. 405 days) and less down-time (40 vs. 90 days) than the firm's existing technology. Eliminating the chelating agents simplifies wastewater treatment, potentially reducing the number of treatment steps and allowing the use of alternative chemicals, which produce more dense sludge. The non-formaldehyde process also uses less water and energy than Crotalus' current process (**Exhibit 5**). Finally, there is evidence the new process improves hole wall integrity, potentially improving product quality.

Financing Needs

The previous year's unpleasant publicity had led Grant Sawyer to seriously consider implementing a non-formaldehyde electroless copper process. The firm had just finished a major capital upgrade, funded in large part by a $1.6 million, 10-year loan from the Rochester National Bank.[1] If Crotalus were to change its manufacturing process, Sawyer estimated the firm would need another $250,000 up front to fund the costs of equipment, changeover, and training. However, if current research reports could be believed, the firm could expect to reap the benefits reported in Exhibit 5 by year end. In addition, materials costs, permitting

EXHIBIT 4: CHEMICAL BATHS IN THE MANUFACTURE OF A TYPICAL PWB

Type of Bath	Number of Baths	Avg Duration (min)	Total Duration (min)
Cleaner / Conditioner	9	165	1,482
Microetching	18	134	2,412
Pre-Dip	8	196	1,568
Catalyst	11	154	1,694
Accelerator	16	126	2,016
Acid Dip	6	140	840
Anti-Tarnish	13	159	2,067
TOTAL	**91**		**13,299**

EXHIBIT 5: COMPARATIVE RESOURCE CONSUMPTION

	Electroless Copper	Non-Formaldehyde Electroless Copper
Process Operating Time (days)	316	142
Water Consumption Rate (gal/ssf)	11.6	3.74
Energy Consumption (BTU/ssf)	568.3	269.9

[1]Sinking fund payments of $160,000 per year will begin in 1997. Any additional loans would be likely to carry a similar provision.

costs and maintenance costs were each anticipated to decrease by 25 percent if the new technology proved successful.

Crotalus Circuits did not have sufficient cash on hand to fund the changeover, which was why Sawyer had phoned Henry Dean. He hoped to arrange an additional $250,000 in financing at the current 10 percent rate to implement his plans. Sawyer believed the resulting cost savings and decreased environmental risks promised by the new technology would offset the additional financial risk to the bank, even in the face of the recent operating loss. A breakdown of the firm's costs under its existing production process is presented in **Exhibit 6**. Finally, Sawyer estimated Crotalus' sales would continue to grow 15 percent annually for the next five years or so. Capital expenditures were likely to outpace this figure by 5 percent.

Banking Concerns

Crotalus' most recent financial performance was nothing to rave about, and alone provided no impetus for lending the firm another $250,000. Dean recalled the company had been a borderline case when the existing loan was approved back in 1995 because of its high debt ratio and below-average liquidity (**Exhibit 7**). On the other hand, Sawyer's plans for non-formaldehyde electroless copper processing seemed to moving in the right direction, decreasing annual operating costs while reducing health, safety and environmental risks. Moreover, Dean worried what might happen if Crotalus went under as a result of its current problems. He had attended a seminar last year on environmental liabilities faced by lenders, and it was not a pretty sight.

Lender Liability. Lender liability for penalties assessed under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA, also known as "Superfund") has been the chief environmental consideration for large banks over the past several years. When Congress passed this legislation in 1980, its intent was to provide a mechanism facilitating the swift remediation of contaminated sites, with payment determinations to be made later. Liability under CERCLA is strict, retroactive and perhaps most forbidding, *joint and several,* meaning that if one party is unable to pay, others are liable for the full extent of damages. Banks are concerned because they may unintentionally acquire contaminated properties during foreclosure, thus becoming potentially responsible for large clean-up costs, which currently average around $50 million for sites on the National Priorities List.

Two defenses are provided for lenders under the 1986 Superfund Amendment and Reauthorization Act (SARA). *Innocent landowners,* defined as potentially responsible parties (PRPs) who were unaware of existing pollution prior to ownership, may be exempt from cleanup liabilities, provided they exercised *due diligence* in determining whether such contamination existed *ex ante.* Evidence of due diligence includes but is

EXHIBIT 6: BREAKDOWN OF PROCESS COSTS FOR EXISTING PRODUCTION PROCESS

Category	Cost
Materials Costs	
Chemicals	$ 44,790
Utilities	
Water	$ 6,503
Electricity	$ 2,757
Gas	$ 0
Permitting Costs	$ 13,642
Production Costs	
Material transportation	$ 829
Labor	$ 36,388
Maintenance Costs	
Tank clean up	$ 6,097
Bath setup	$ 1,374
Sampling and testing	$ 4,314
Filter replacement	$ 1,610
TOTAL COST	$ 118,304

EXHIBIT 7: COMPARATIVE RATIO ANALYSIS, 1995

Performance Ratio	Crotalus Circuits	Printed Wire Board Industry
Current Ratio	1.73	2.83
Quick Ratio	1.37	1.99
Inventory Turnover	7.99 x	5.78 x
Total Asset Turnover	1.42 x	1.26 x
Average Collection Period	65 days	58 days
Sales / Net Property, Plant & Equipment	4.12 x	6.26 x
Return on Assets	11.8 %	-6.81 %
Return on Equity	26.6 %	6.66 %
Times Interest Earned	23.10 x	34.00 x
Total Debt / Total Assets	55.6 %	29.14 %
Beta Coefficient	1.2	1.3

Source: Compustat

not limited to pre-transaction inquiries into previous ownership and site usage, in addition to environmental audits. Essentially, a lender must show it did not know and had no reason to know of the presence of any hazardous substances disposed at the site. SARA also clarified the meaning of "owner or operator" under the Superfund statutes, specifically exempting ". . . a person who without participating in the management of the facility, holds indicia of ownership primarily to protect his security interest in the vessel or facility." The *security interest exemption,* as this clause has come to be known, was designed to protect lenders who might become owners of a contaminated property as a result of foreclosure, and who held title solely for the purpose of securing their loan interest. Significant confusion exists concerning the intent of this passage. Several well-known cases have tested the courts' interpretation of this statute, with mixed results (**Exhibit 8**).

EXHIBIT 8: IMPORTANT COURT CASES INVOLVING LENDER LIABILITY UNDER CERCLA

United States v. Mirabile (E.D. Pa. 1985)

In *Mirabile,* two banks foreclosed on a bankrupt paint manufacturing firm, secured the property against vandalism, and made inquiries concerning the disposal of existing hazardous wastes before selling the property to Anna and Thomas Mirabile. The EPA spent almost $250,000 removing the wastes, then filed for compensation from the Mirabiles, who joined the two banks as co-defendants. The court held that since the banks did not participate in the day-to-day management of the firm, but merely took steps to secure the property against further depreciation, they were not owners or operators under CERCLA, and thus not liable for cleanup costs.

United States v. Maryland Bank and Trust Company (D. Md. 1986)

In *Maryland Bank and Trust,* a lender foreclosed on a Maryland farm that had been used to operate a garbage business but did not immediately resell the property. Later, EPA inspected the site, found improperly stored hazardous wastes and ultimately removed the wastes at a cost of $500,000. EPA then filed for reimbursement from the bank, claiming it had been an owner for the four years prior to resale. The court held that, because the title to mortgaged property is more than mere "indicia of ownership," the security interest exemption did not protect the lender and the bank's security interest terminated at the foreclosure sale. Therefore, the lender was an owner under CERCLA.

United States v. Fleet Factors Corporation (11th Cir. 1990)

In *Fleet Factors,* a commercial factoring firm held a security interest in the equipment, inventory and fixtures of a bankrupt company as well as a security interest in the debtor's real property. The factoring firm foreclosed on a portion of the personal property, some of which was removed by a third party and sold. In 1984, EPA inspected the facility and initiated cleanup efforts Three years later, the county purchased the property in a tax foreclosure sale. EPA sued to recover its cleanup costs, claiming Fleet Factors was liable as a past owner or operator of the site. The court acknowledged Fleet Factor's secured creditor's exemption (it held only a deed of trust), but noted "a secured lender could be held liable as an owner even if it did not acquire the property but had only participated in the financial management of the borrower's facility to a degree suggesting that it could have affected hazardous waste disposal decisions if it had so chosen. The court felt this decision would encourage lenders to increase their environmental due diligence and compliance reviews.

Bergsoe Metal Corporation v. East Asiatic Company (9th Cir. 1990)

In *Bergsoe,* the lender, a municipal corporation in Oregon, held a warranty deed to contaminated property. The lender had not participated in the management of the facility, although it had the right to do so, and did not foreclose on the property. The Ninth Circuit court held that "... there must be some actual management of the facility before a secured creditor will fall outside the security interest exemption. Input during the planning stages of a large-scale project does not necessarily constitute "management."

EPA Rule Clarification (1992)

In 1992, the US EPA issued a final regulation defining the secured creditor exemption, identifying factors necessary to establish a lender's participation in the management of a business, and hence liability as an owner and operator under CERCLA. Lenders were exempted from liability during investigations, inspections and monitoring activities needed to determine whether or not a borrower was complying with environmental regulations.

Kelley v. Environmental Protection Agency (D.C. Cir.1994)

In April 1994 the DC Circuit Court of Appeals set aside EPA's guidelines on lender liability, arguing that Congress did not give EPA such authority under CERCLA. It is likely a clear interpretation will require legislative authority.

Of primary concern is the extent to which a secured creditor can oversee the affairs of a borrower and not lose its exemption from Superfund liability. Foreclosure to protect a security interest is possible, but the degree of participation by the lending institution in the creditor's operating and financial affairs remains open to question.

Other Sources of Environmental Risk. Lending institutions are exposed to several other sources of environmental risk. A lender may be liable for the release or threatened release or transport of hazardous substances under CERCLA as well as other federal, state and local laws. Even if the lender is not responsible under CERCLA, it may be liable for (1) Arranging for the transport and disposal of hazardous substances or (2) Allowing the release of hazardous substances once it takes control of a facility. For example, improper disposal of drums containing toxic chemicals can lead to enforcement action under the Resource Conservation and Recovery Act (RCRA), while continued discharge of excessive waste streams may violate National Pollution Discharge Elimination System (NPDES) permitting procedures and run afoul of federal and state pollution control programs.

Collateral values can be affected by environmental liens, remaining site contamination and environmental stigma — a reduction in value resulting from increased risks associated with contaminated property. The fear of hidden cleanup costs, public liability, lack of mortgageability and / or simply fear of the unknown contribute to *environmental stigma*. Credit or default risk increases for borrowers suddenly faced with large environmental costs. Enforcement penalties, compliance expenses and cleanup costs can reduce cash flows and impair a firm's ability to service its financial obligations. Criminal or tort liability may also arise via suits brought by enforcement agencies or third parties. The lending institution, its officers, and agents may also be exposed to direct criminal liability if the lender can be proven to have aided and abetted the borrower's criminal actions.

Conclusion

Henry Dean knew he had to respond swiftly to Grant Sawyer's request regarding an increase Crotalus' loan commitment by $250,000. At issue were the expected benefits and costs to the bank, Crotalus Circuits, and to a somewhat lesser degree, overall society. If the new technology worked as well as promised, both formaldehyde and copper sulfate use would likely decline, improving living conditions for both man and nature.

Study Questions

1. What factors might entice Dean to approve an additional $250,000 loan to Crotalus Circuits?
   What factors might discourage this action?

2. What about switching to a non-formaldehyde electroless copper process makes sense
   from an investment perspective?
   From an environmental perspective?

3. Will Crotalus be able to repay its loan within five years?
   If not, what options does the Rochester National Bank have?

4. What do you recommend Henry Dean do?