

Works 54

Chester, SC

A Model For Integrated Supply

PPG Regional Fiber Glass Purchasing

Ray Francis, General Manager

CONTENTS

1. Rationale	1
2. General history	2
Overview.	2
History -- Dixie Industrial	2
Figure 1 : Development of PPG/Dixie Relationship.	4
History -- Henley Paper	5
History -- ChemCentral	5
3. Current status	6
Performance -- Dixie Industrial	6
Table 1: Chester Storeroom Activity -- June 1996	7
Performance -- Henley Paper.	7
Performance -- ChemCentral	8
4. Financial outcomes.	9
Financial Outcomes -- Dixie Industrial	9
Table 2: Direct Financial Benefits	10
Financial Outcomes -- Henley Paper	11
Table 3: Direct Financial Benefits	11
Financial Outcomes -- ChemCentral	12
Table 4: Direct Financial Benefits	12
5. Summary	13
Table 5: Summary of Financial Benefits	13
Appendix: Calculation of Transaction Costs	14

Works 54

Chester, SC

A Model For Integrated Supply

RATIONALE

In order to sharpen PPG Fiber Glass's position in a highly competitive market, PPG Regional Fiber Glass Purchasing has steadily extended the close relationships it has enjoyed for years with its customers into the supplier chain. Outstanding companies such as PPG have long recognized that by better understanding their customers' needs, they could outmaneuver their competition and provide unmatched levels of service. The current global atmosphere has also encouraged them to realize that not only are they suppliers, they are also customers; and that, typically, 50-75% of their unit costs are in purchased materials. Since suppliers are on the receiving end of these revenues, value-added relationships with them can double the company's competitive resources. This recognition has driven home the need for a truly strategic role for purchasing and supply management and created a new obligation to nurture and to build suppliers to world-class status and to keep those suppliers world-class through a process of continuous improvement.

PPG Regional Fiber Glass Purchasing has aggressively sought to increase its value-added role by looking for opportunities to reduce both the costs of materials and the costs of the activities associated with the supply of materials. Outsourcing, which uses the resources of suppliers in order to conserve and optimize PPG's internal resources, has been a critical strategy for reducing costs and improving the bottom line. Through outsourcing, PPG Regional Fiber Glass Purchasing has:

- ◆ improved the business focus
- ◆ reduced/controlled costs
- ◆ freed capital funds
- ◆ freed noncapital resources
- ◆ gained access to expertise of suppliers
- ◆ reduced PPG's risk by sharing it with suppliers
- ◆ improved level of service
- ◆ centralized and increased on-time delivery
- ◆ eliminated inventory
- ◆ reduced storage expense.

Each of these underscores the critical need for increasingly closer supplier relationships which are focused on innovation, flexibility, open communication, continuous improvement, and mutual benefit.

GENERAL HISTORY

OVERVIEW

In a continuing effort to improve supply management and to add value to the company, purchasing is currently testing innovative relationships with three suppliers at the Chester, SC, Works 54 plant. Although high levels of outsourcing have not been appropriate for all PPG fiber glass plants, excellent management support at the Chester facility created an opportunity to implement on-site strategic supplier alliances. By maintaining open communications and a cooperative, flexible, solution-oriented environment, management at Chester created an atmosphere which encouraged these relationships.

During the construction phase the Chester plant represented a model for successful alliances between purchasing and the suppliers of services and materials. Although original plans called for a rebuild of the existing facility over a 16-month period of time, the plant was instead torn down and completely rebuilt in 13 months from ground-breaking to glass production. This rapid start-up was made possible by outstanding purchasing-engineering teamwork in conjunction with close relationships with the contractor and with Dixie Industrial, the MRO supplier. Dixie Industrial was on site two months before start-up and provided easy access to supplies and valuable technical expertise.

Regional Purchasing's vision of the new supplier relationships at the Chester facility focused on suppliers of MRO, binder, and packaging. Because identifying the best match between suppliers and PPG was of central importance, final selection took approximately eight months to complete. In addition to bids, critical elements in the selection process included identifying suppliers with a demonstrated commitment to customer satisfaction, an overall business culture and quality process compatible with PPG's, strength of management qualifications and experience, and the ability to build on previous relationships with PPG and to interface with PPG's computer system. In some cases purchasing personnel visited potential suppliers' sites and interviewed their customers regarding service. Three suppliers were selected:

- Dixie Industrial - maintenance, repair, & operating supplies (MRO)
- Henley Paper - packaging
- ChemCentral - binder materials and chemicals

HISTORY -- DIXIE INDUSTRIAL

PPG Regional Fiber Glass Purchasing's history with Dixie Industrial provides an example of how a close working relationship with a critical supplier can result in improved performance, higher-quality service, and cost savings. In 1985, after several years of a traditional, customer-supplier relationship, PPG Regional Fiber Glass Purchasing and Dixie Industrial implemented a new

partnership in which Dixie became responsible for electronic data interchange (EDI), just-in-time delivery (called scheduled delivery), and systems contracts. In addition, PPG's production, engineering and maintenance personnel were able to request supplies directly from Dixie. In 1993, the relationship deepened when Dixie began to provide on-site, technical support personnel at the Shelby, NC, Works 52 plant, assisting with inventory control and standardization, reducing the number of transactions, and having direct access to PPG's computer system for scheduling and ordering information. After the Shelby operation was established, the system was duplicated at the Lexington plant with the additional improvement of combining scheduled deliveries and systems contracts. A multi-site and global supplier for PPG, Dixie Industrial also supplies the England and Venezuela plants. The continuing development of PPG's relationship with Dixie Industrial is summarized in Figure 1.

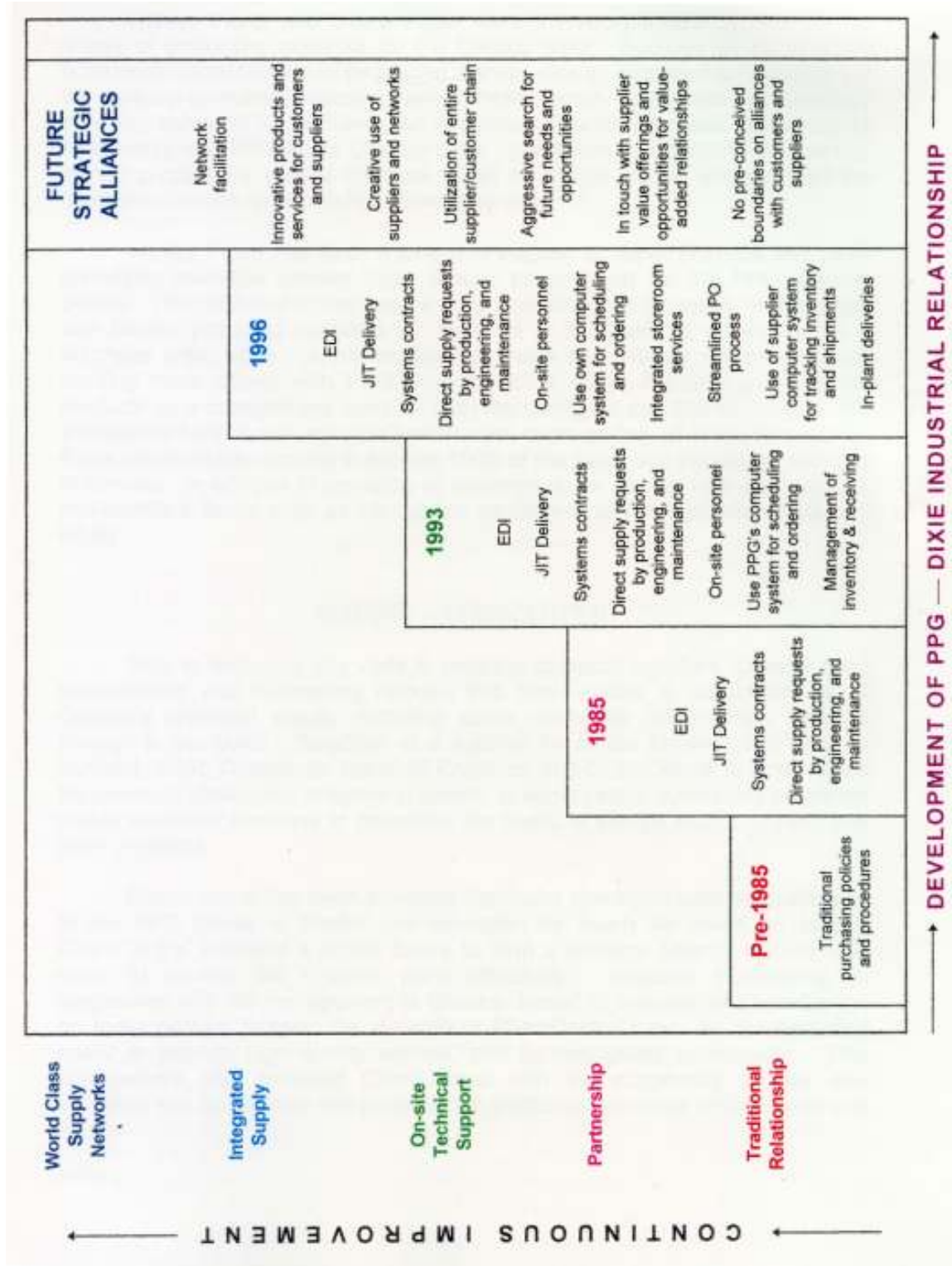
In its proposal for Chester, Dixie benchmarked its services using the Shelby facility, including definition of services, personnel, inventory buy-back (ownership of materials), cost, pricing, invoicing, administration, insurance, safety, and layout of the storeroom. Dixie provided for regular meetings between PPG purchasing and its own personnel and for the implementation of computer systems for tracking inventory and shipments.

Purchasing's initial goals entering into the selection process included:

- ◆ increased inventory control
- ◆ reduced duplications, slow and dead inventory
- ◆ reduced inventory investment
- ◆ elimination of cost of storeroom operations (personnel and carrying costs)
- ◆ reduced supplier base
- ◆ improved quality of supplies
- ◆ standardization of inventory
- ◆ reduced transactions
- ◆ elimination of redundant costs in the purchasing, receiving, and payables processes, and in supplier maintenance
- ◆ stabilized manufacturing output through reduced stockouts and reduced downtime.

This long-term, mutually-beneficial relationship between PPG Regional Fiber Glass Purchasing and Dixie Industrial provided the basis for the strategic partnership at the Chester plant. Although original plans called for Dixie to warehouse materials at Shelby, the proposal was revised to provide for a separate storeroom at Chester for daily operating supplies, with safety stock held at Dixie's Shelby site. For the Chester plant, Dixie proposed an integrated system with updated costs and a streamlined purchase order process, significantly deepening the PPG/Dixie relationship.

Figure 1



HISTORY -- HENLEY PAPER

Henley Paper and Dillard Paper were the two principle bidders for the supply of packaging materials for the Chester plant. Because of the potential bottleneck characteristics of packaging, service was an important consideration in the contract-awarding process. Henley Paper, which was already satisfactorily servicing contracts at the Lexington and Shelby plants, proposed deepening its relationship with PPG at the Chester plant. In addition to submitting the low bid, Henley proposed a volume discount based on annual volume and provided the best opportunities for excellent customer service.

Henley Paper has been a long-time supplier of paper products and basic packaging materials (plastic bags, straps, paper bags) for the PPG plant in Shelby. This relationship has been a fairly traditional one for nearly twenty years with Henley providing materials for PPG out of its Charlotte warehouse on a purchase order basis. Approximately two years ago, Henley personnel began working more closely with PPG Regional Fiber Glass Purchasing to provide products on a consignment basis for both the Lexington and Shelby plants. This arrangement continued until the Chester plant came on line, at which time Henley Paper received the contract to provide 100% of the paper and packaging services at Chester. In addition to providing all paper products, Henley now also supplies non-standard items such as corrugated cardboard, wooden pallets, tubes and labels.

HISTORY -- CHEMCENTRAL

Prior to beginning site visits to potential chemical suppliers, Chester plant management and Purchasing decided that they wanted to consolidate all of Chester's chemical needs, including some chemicals not normally handled through a distributor. Selection of a supplier for binder involved site visits at Ashland, VWR, Continental Industrial Chemical, and ChemCentral in order to see the chemical distribution program in action. In some cases, purchasing personnel visited customer locations to determine the levels of service each company had been providing.

ChemCentral has been providing distributor chemicals such as acetic acid to the PPG plants at Shelby and Lexington for nearly six years. In its bid, ChemCentral indicated a strong desire to form a strategic alliance with PPG in order to service the Chester plant effectively. Regional Purchasing, in conjunction with the management at Chester, based its selection of ChemCentral on three primary factors: the strength of ChemCentral's bid, its demonstrated ability to provide high quality service, and its willingness to innovate. This arrangement also provided ChemCentral with the opportunity to use new suppliers and to develop the potential for additional contracts at Lexington and Shelby.

CURRENT STATUS

PERFORMANCE -- DIXIE INDUSTRIAL

At the Chester plant, Dixie Industrial's role has changed from an on-site technical resource to an integrated supply processor. The supply system at Chester is a point of sale operation in which supplies are ordered, received, unloaded, and processed by Dixie. Since the opening of the plant, Dixie has been performing the following duties:

- ◆ debit memos
- ◆ MSDS files
- ◆ printing SHIS labels
- ◆ emergency pick up and delivery
- ◆ issuing function
- ◆ delivering in-plant
- ◆ storing and placing packaging and binder (staging)
- ◆ recording all transactions with AMEX
- ◆ reporting monthly by total, card, and item
- ◆ receiving into PPG's computer system
- ◆ using Dixie-designed software to monitor inventory
- ◆ unloading trucks
- ◆ delivering daily between Shelby & Chester - also delivering samples, finished goods, and raw materials outside of normal deliveries.

Dixie Industrial also works directly with other suppliers using PPG standards and existing item numbers. Dixie is the primary integrator of all storeroom suppliers, coordinating purchases from Dixie Bearing; Henley Paper; Pumps, Parts and Service; Bryant Supply; Electric Supply and Equipment; Cameron & Barkley (electronics); Maco; Parkway; Saco-Lowell; and Dellinger.

Under this arrangement, Dixie Industrial has created cost savings in a variety of ways:

- ◆ provision of two on-site personnel replacing more expensive PPG staff
- ◆ efficiency of personnel
- ◆ elimination of carrying costs
- ◆ carrying inventory data through Dixie's computer system
- ◆ reduction in numbers of transactions
- ◆ reduction of costs for inventory storage space.

Communications capabilities with Dixie personnel are extensive and are another of the successful aspects of the alliance. Interactive components include a pager, two on-site personnel, and e-mail, primarily involving production and management team members at the Chester facility.

An example of the cost savings to PPG can be found in the streamlined AMEX inventory process implemented by PPG and Dixie. In this process, purchases under \$2,000 are made on American Express cards (AMEX), resulting in a single monthly summary. See Table 1 for details of June activity. Additionally, AMEX breaks down the bills for each of their 54 suppliers on the monthly summary invoice. This results in cost savings in tracking by purchasing, simplified supply to plant personnel, and reduced invoices and purchasing department time.

Table 1

CHESTER STOREROOM ACTIVITY -- JUNE 1996

Activity	Number of Items	Dollar Value
Number of issues	387	
Total storeroom items	789	
Receipts for Dixie-owned inventory	121	
AMEX storeroom charges	20	\$ 31,224
AMEX direct charges	335	\$ 37,027
Dixie-owned inventory		\$206,950
Contract services charge -- Dixie personnel		\$ 5,416
Value of spare parts inventory		\$118,903
YTD Dixie-initiated cost savings projects		\$ 16,400

PERFORMANCE -- HENLEY PAPER

Like Dixie Industrial, Henley Paper is also a multi-site and global supplier, an integrator of services for PPG Fiber Glass, and a strategic partner at the Chester plant. However, some distinct differences apply: Henley Paper has not had the long history of supplying products and services to PPG that Dixie has had and, because PPG's packaging needs vary from plant to plant, each of the three plants has involved a different set of requirements.

Henley Paper is the single source for packaging at Chester, responsible for all cartons, labels, stretch film, strapping, and pallets. Henley also manages all packaging materials for the Chester plant, based on anticipated needs. Packaging inventory is on consignment with once-a-month billing, and PPG pays only for what has been used. Safety stock is stored in dedicated space in Henley's Charlotte warehouse in the event of unexpected schedule changes. A representative from Henley visits the site twice a week and is on call continuously, and an e-mail system is on-line and provides efficient transmission of memoranda and information.

PERFORMANCE -- CHEMCENTRAL

ChemCentral serves as a chemical warehouse for the Chester plant. In this capacity ChemCentral buys from other chemical manufacturers and stores, inventories, labels, and ships nearly all chemicals for the Chester plant operation. This has created a need for new modes of delivery (packaging) and has opened up the possibility of future quantity discounts. Chemical and binder supplies are delivered to the site and paid for as they are used by the plant. Additionally, ChemCentral provides a representative on-site one day a week and maintains electronic communications through e-mail and round-the-clock coverage via telephone and pager.

Specific expectations of ChemCentral include:

- ◆ pre-lot and pre-approval sampling
- ◆ maintenance of the MSDS log through PPG's computer system
- ◆ bringing item numbers directly into the ChemCentral computer system through computer interface
- ◆ once-a-month billing.
- ◆ SHIS labeling of drums prior to delivery
- ◆ inventory management through direct contact with Chester personnel.

FINANCIAL OUTCOMES

FINANCIAL OUTCOMES -- DIXIE INDUSTRIAL

The Chester plant supplier alliance between PPG Fiber Glass and Dixie Industrial has resulted in both direct savings and intangible benefits for PPG. The direct savings have been a result of the services supplied by Dixie in reductions in labor costs, carrying costs, transaction costs, and costs associated with the construction of warehouse space. Figures for the month of June, 1996, are shown in Table 2.

Direct Savings

Labor Costs

Dixie Industrial supplies two on-site personnel to run the storeroom at the Chester facility for a monthly fee of \$5,418. Computed as an hourly rate, each of Dixie's on-site personnel costs PPG Fiber Glass \$15.66/hour. By comparison, the loaded rate (which includes benefits and compensation, as well as the hourly rate) for Shelby personnel of the same caliber is \$22.22 (the average of PPG's cost for a clerk at \$18.71/hour and a supervisor at \$25.73/hour). This has resulted in a monthly savings to PPG of \$2,270. In addition, these personnel, as specialists in MRO supply, bring a level of expertise to management of PPG's storeroom that has a number of benefits. For example, since MRO supply is a core competency of Dixie's employees and not of PPG employees, it is probable that more than two PPG employees would be required to fill the same functions. Furthermore, Dixie Industrial employees frequently work overtime which is not charged to PPG.

Carrying Costs

Since Dixie continues to own the materials held in the storeroom until they are actually issued, PPG is no longer responsible for the costs associated with stocking that inventory. Carrying charges for inventory at Shelby generally fall in the 13% range or \$14,298 per month. At Chester, Dixie's carrying charges run 7.5% or \$8,918 per month, resulting in a net savings to PPG of \$5,381 per month.

Transaction Costs

Reduced transactions have resulted in savings to PPG Fiber Glass in both computer system and personnel costs. Without the use of AMEX and monthly billing through Dixie's computer system, transactions in the form of purchase orders, issues, invoices, and receiving documents would have cost PPG \$13,301 in computer system costs and \$16,554 in personnel costs. Monthly billing by Dixie Industrial has dramatically reduced PPG's transactions to one purchase order and one invoice per month at a cost of \$9 in computer systems and \$41 in personnel.

Space Costs

Construction, insurance, and maintenance costs for warehouse space have been reduced due to the smaller square footage requirements for the storeroom facility at the Chester plant. PPG provides storeroom space at Chester for daily operating supplies only. Safety stock is held at Dixie's warehouse in Shelby. If Dixie Industrial were not providing storage for safety stock, PPG Fiber Glass would have been required to construct an additional 1,000 square feet of space at a cost of \$60/square foot. This \$6,000 construction cost depreciated over a period of five years results in a yearly space savings of \$1,200.

Table 2

Direct Financial Benefits of Integrated Supply Relationship with Dixie Industrial

Service	Cost at Works 52 per month	Cost at Works 54 per month	Savings per month
Labor (based on two employees ¹)	\$22.22/ hr/ person \$ 7,688	\$15.66/ hr/ person \$5,418	\$6.48/ hr/ person \$ 2,270
Carrying costs	13% \$14,298	7.5% \$8,918	5.5% \$ 5,381
Transaction costs: computer system ²	\$13,301	\$ 9	\$13,292
Transaction costs: personnel ³	\$16,554	\$ 41	\$16,513
Total Monthly Savings			\$37,456
Space ⁴	One-time construction savings		\$ 6,000

¹ Dixie Industrial currently provides two on-site personnel in the storeroom at Works 54. The hourly rate calculated for Works 52 comparable employees is an average of the cost to PPG, including hourly rate, benefits and compensation, of one clerical and one supervisory employee. However, since supply is a core competency of Dixie's employees and not of PPG employees, it is probable that more than two PPG employees would be required to fill the same functions. This additional savings is intangible. See above text for more detail.

² Calculation of computer costs associated with transactions was based on the number of transactions at Works 54 in June 1996. The figure includes purchase orders, issues, invoices at the manual rate for issues and at the electronic rate for AMEX, and receipts.

³ Calculation of personnel costs associated with transactions was based on the number of transactions at Works 54 in June 1996. The figure includes loaded labor rates on purchase orders, issues, and receipts.

⁴ PPG provides storeroom space at Chester for daily operating supplies only. Safety stock is held at Dixie's warehouse in Shelby. If Dixie Industrial were not storing safety stock for the Chester plant in their Shelby warehouse, PPG would have been required to construct an estimated additional 1,000 square feet of space at a cost of \$60/square foot.

Intangible Benefits

Intangible benefits are accrued by having on-site Dixie Industrial personnel available for continuous communication and problem-solving. For example, because Dixie's on-site personnel were recently able to recommend an alternative source for orders of two timing belts for winders and a proximity switch, PPG saved \$16,400. Additional intangible benefits include reduced elapsed time for transactions, an average of 1.5 invoices per purchase order for which no receipts are required, fewer issues, and reduced non-stores costs.

FINANCIAL OUTCOMES -- HENLEY PAPER

Monthly financial benefits of the integrated supply relationship with Henley Paper are shown below in Table 3. Because Henley Paper carries all Chester inventory on consignment, transaction cost reductions are accrued through reduced purchase orders, invoices, and receipts. Finally, since Henley Paper stores safety stock in its own warehouse, PPG Fiber Glass saved construction costs on 3,150 square feet of warehouse space at a cost of \$60/square foot, resulting in a construction savings of \$189,000. Depreciated over five years, this is a yearly savings to PPG of \$37,800 per year.

Table 3

Direct Financial Benefits of Integrated Supply Relationship with Henley Paper

Service	Cost at Works 52 per month	Cost at Works 54 per month	Savings per month
Labor	Ø	Ø	Ø
Carrying costs	13% \$16,300	7.5% \$ 9,404	5.5% \$ 6,896
Transaction costs: computer system ¹	\$ 1,520	\$ 403	\$ 1,117
Transaction costs: personnel ²	\$ 1,136	\$ 142	\$ 994
Total Monthly Savings			\$ 9,007
Space ³	One-time construction savings		\$189,000

¹ Calculation of computer costs associated with transactions was based on the average transactions at Works 54 from March through June, 1996 (87 total transactions). The figure includes purchase orders, issues, invoices at the manual rate, and receipts.

² Calculation of personnel costs associated with transactions was based on the average monthly transactions at Works 54 from March through June, 1996 (87 total transactions). The figure includes loaded labor rates on purchase orders, issues, and receipts.

³ PPG provides storeroom space at Chester for daily operating supplies. Safety stock is held at Henley's warehouse in Charlotte. PPG saved construction costs on 3,150 square feet of space at a cost of \$60/square foot.

FINANCIAL OUTCOMES -- CHEMCENTRAL

The most recent available monthly figures place ChemCentral's current inventory value at \$46,949, thereby reducing PPG's total inventory by a like amount, plus a 13% carrying charge. ChemCentral has reserved for PPG Fiber Glass 2,200 square feet of storage at its own facility. At \$60 per square foot, this results in a construction savings to PPG of \$132,000. Depreciated over five years, this represents a yearly savings to PPG of \$26,400.

ChemCentral processes an average of eight purchase orders per month at the Chester plant, as well as the associated receipts and invoices, on behalf of PPG Fiber Glass. Total calculation of savings related to processing will ultimately include costs of these transactions, as well as reduced numbers of transactions resulting from integration of supply.

Table 4
Direct Financial Benefits of Integrated Supply Relationship
with ChemCentral

Service	Cost at Works 52 per month	Cost at Works 54 per month	Savings per month
Labor	Ø	Ø	Ø
Carrying costs	13% \$ 6,103	9% \$ 4,225	4% \$ 1,878
Transaction costs: computer system ¹	\$ 122	\$ 9	\$ 113
Transaction costs: personnel ²	\$ 336	\$ 41	\$ 295
Total Monthly Savings			\$ 2,286
Space ³	One-time construction savings		\$132,000

¹ Calculation of computer costs associated with transactions was based on the average number of transactions at Works 54 from March through June, 1996. The figure includes purchase orders (24 total or 8/month), invoices (25 total or 8/month), and receipts (25 total or 8/month).

² Calculation of personnel costs associated with transactions was based on the average number of transactions at Works 54 from March through June, 1996. The figure includes loaded labor rates for purchase orders (24 total or 8/month) and receipts (25 total or 8/month). Personnel cost for invoices is zero.

³ ChemCentral has dedicated to PPG Fiber Glass 2,200 square feet of storage at its own facility. PPG saved construction costs on this space at a cost of \$60/square foot.

SUMMARY

The financial benefits of the Chester plant project are best observed in terms of yearly cost savings. As seen below and summarized in the appendix, annual savings from Dixie Industrial are \$449,472 in direct savings and \$1,200 on construction costs for a one year total of \$450,672. Annual savings from Henley Paper are \$108,084 in direct savings and \$37,800 in construction cost savings for a one year total of \$145,884. Yearly figures from ChemCentral are \$27,432 in direct savings and \$26,400 in construction cost savings for a one year total of \$53,832.

Cost savings to PPG Fiber Glass as a direct result of the alliances with Dixie Industrial, Henley Paper, and ChemCentral total \$650,388 per year and \$3,251,940 over five years. This represents a substantial savings and is indicative of the direct benefits incurred from increased strategic supplier relationships.

Table 5

SUMMARY OF FINANCIAL BENEFITS

Company	Direct Monthly Savings	Annual Construction Savings	Annual Savings
Dixie Industrial	\$37,456	\$ 1,200	\$450,672
Henley Paper	\$ 9,007	\$37,800	\$145,884
ChemCentral	\$ 2,286	\$26,400	\$ 53,832
Totals	\$48,749	\$65,400	\$650,388

The plant at Chester was a green field site and constituted a testing ground for PPG Fiber Glass and its suppliers. Should these relationships continue to be successful over a one-year period of time, the concept should be considered for the Shelby and Lexington plants. At this time, PPG Purchasing management is nurturing these supplier relationships in order to continue their development. Cooperation and solution-oriented (not blaming) thinking, open communications, and daily visibility of PPG management will remain crucial to this growth. This current system of supplier alliances remains primarily reactive, but it is increasingly efficient and is continuously improving. Such alliances will sharpen PPG Fiber Glass's competitive edge and ensure its world class status in the competitive global marketplace.

APPENDIX

Calculation of Transaction Costs In Tables 2, 3, and 4

Transaction costs are calculated using the number of transactions over a one month period associated with the Works 54 plant (Chester) and the costs of the same type of transaction activities at the Works 52 plant (Shelby). This yields the cost of transactions at Chester had they been incurred under the supplier arrangements at Shelby. Using activity based costing, transaction activities are divided into computer system costs and personnel costs associated with processing each type of transaction.

Calculations for transactions associated with each supplier are shown in separate sections, with transaction computer system costs illustrated first, followed by transaction personnel costs.

All transaction calculations are based on the following factors:

Computer system costs

Purchase order = \$5.81
 Issue = \$5.81
 Manual invoice = \$3.65
 Electronic invoice; i.e., AMEX = \$0.76
 Receipt = \$5.81

Personnel costs

Purchase order = \$40.94
 Issue = \$2.00
 Invoice = 0
 Receipt = \$1.12

DIXIE INDUSTRIAL -- Calculations for Table 2**COMPUTER SYSTEM COSTS OF TRANSACTION ACTIVITIES****Works 52**

Transaction computer system costs for the month of June are calculated by multiplying each computer system cost factor by the number of items relevant to it. The number of items is shown in Table 1, "Chester Storeroom Activity -- June 1996."

Purchase orders:

System cost X AMEX storeroom charges (\$5.81 X 20) =	\$ 116.20	
System cost X AMEX direct charges (\$5.81 X 335) =	1,946.35	
System cost X number of issues (\$5.81 X 387) =	<u>2,248.47</u>	
		\$ 4,311.02

Invoices: Average 1.5 invoices per purchase order.

System cost electronic invoice X 1.5 AMEX storeroom charges (\$0.76 X 30) =	\$ 22.80	
System cost electronic invoice X 1.5 AMEX direct charges (\$0.76 X 502.5) =	381.90	
System cost manual invoice X 1.5 issues (\$3.65 X 580.5) =	<u>2,118.83</u>	
		\$ 2,523.53

Receipts: Average 1.5 receipts per purchase order.

System cost X 1.5 AMEX storeroom charges (\$5.81 X 30) =	\$ 174.30	
System cost X 1.5 AMEX direct charges (\$5.81 X 502.5) =	2,919.53	
System cost X 1.5 issues (\$5.81 X 580.5) =	<u>3,372.71</u>	
		<u>\$ 6,466.54</u>

Total Works 52 transaction computer system costs	\$13,301.09
--	-------------

Works 54

The agreement with Dixie Industrial at Works 54 (Chester) provides for once-a-month billing, which consists of one purchase order and one invoice per month.

Purchase orders:

System cost X one purchase order = (\$5.81 X 1)	\$5.81
---	--------

Invoices:

System cost manual invoice X one invoice = (\$3.65 X 1)	<u>\$3.65</u>
---	---------------

Total Works 54 transaction computer system costs	\$9.46
--	--------

DIXIE INDUSTRIAL -- Calculations for Table 2

PERSONNEL COSTS OF TRANSACTION ACTIVITIES

Works 52

Transaction personnel costs for the month of June are calculated by multiplying each personnel cost factor by the number of items relevant to it. The number of items is shown in Table 1, "Chester Storeroom Activity -- June 1996."

Purchase orders:

Personnel cost X AMEX storeroom charges (\$40.94 X 20) =	\$ 818.80	
Personnel cost X AMEX direct charges (\$40.94 X 335) =	13,714.90	
Personnel cost X number of issues (\$2.00 X 387) =	<u>774.00</u>	
		\$ 15,307.70

Receipts: Average 1.5 receipts per purchase order.

Personnel cost X 1.5 AMEX storeroom charges (\$1.12 X 30) =	\$ 33.60	
Personnel cost X 1.5 AMEX direct charges (\$1.12 X 502.5) =	562.80	
Personnel cost X 1.5 issues (\$1.12 X 580.5) =	<u>650.16</u>	
		<u>\$ 1,246.56</u>

Total Works 52 transaction personnel costs	\$16,554.26
--	-------------

Works 54

The agreement with Dixie Industrial at Works 54 (Chester) provides for once-a-month billing, which consists of one purchase order and one invoice per month.

Purchase orders:

Personnel cost X one purchase order = (\$40.94 X 1)	<u>\$40.94</u>
Total Works 54 transaction personnel costs	\$40.94

HENLEY PAPER -- Calculations for Table 3**COMPUTER SYSTEM COSTS OF TRANSACTION ACTIVITIES****Works 52**

The average number of transactions for the first four months of operation at Works 54 (total of 87) is 22. From that average is extrapolated 22 purchase orders, 54 issues, 33 invoices, and 33 receipts. Each transaction type is then multiplied by the relevant computer system cost factor. Because there are no American Express charges, only the manual invoice cost factor is used.

Purchase orders:

System cost X purchase orders (\$5.81 X 22) =	\$ 127.82	
System cost X issues (\$5.81 X 54) =	<u>313.74</u>	
		\$ 441.56

Invoices: Average 1.5 invoices per purchase order.

System cost manual invoice X 1.5 purchase orders (\$3.65 X 33) =	\$ 120.45	
System cost manual invoice X 1.5 issues (\$3.65 X 81) =	<u>295.65</u>	
		\$ 416.10

Receipts: Average 1.5 receipts per purchase order.

System cost X 1.5 purchase orders (\$5.81 X 33) =	\$ 191.73	
System cost X 1.5 issues (\$5.81 X 81) =	<u>470.61</u>	
		<u>\$ 662.34</u>

Total Works 52 transaction computer system costs		\$1,520.00
--	--	------------

Works 54

The agreement with Henley Paper at Works 54 (Chester) provides for once-a-month billing, which consists of one purchase order and one invoice per month. In addition, there is an average of 33 receipts and 27 issues per month.

Purchase orders:

System cost X one purchase order = (\$5.81 X 1)		\$ 5.81
---	--	---------

Invoices: Average 1.5 invoices per purchase order.

System cost manual invoice X 1.5 one invoice = (\$3.65 X 1.5)	\$ 5.47	
System cost manual invoice X 1.5 issues = (\$3.65 X 40.5)	<u>147.83</u>	
		153.30

Receipts: Average 1.5 receipts per purchase order.

System cost X 1.5 purchase orders (\$5.81 X 1.5) =	\$ 8.70	
System cost X 1.5 issues (\$5.81 X 40.5) =	<u>235.32</u>	
		<u>244.02</u>

Total Works 54 transaction computer system costs		\$ 403.13
--	--	-----------

HENLEY PAPER -- Calculations for Table 3**PERSONNEL COSTS OF TRANSACTION ACTIVITIES****Works 52**

The average number of transactions for the first four months of operation at Works 54 (total of 87) is 22. From that average is extrapolated 22 purchase orders, 54 issues, 33 invoices, and 33 receipts. Each transaction type is then multiplied by the relevant transaction personnel cost factor.

Purchase orders:

Personnel cost X purchase orders (\$40.94 X 22) =	\$ 900.68	
Personnel cost X number of issues (\$2.00 X 54) =	<u>108.00</u>	
		\$1,008.68

Receipts: Average 1.5 receipts per purchase order.

Personnel cost X 1.5 purchase orders (\$1.12 X 33) =	\$ 36.96	
Personnel cost X 1.5 issues (\$1.12 X 81) =	<u>90.72</u>	
		<u>\$ 127.68</u>

Total Works 52 transaction personnel costs		\$1,136.36
--	--	------------

Works 54

The agreement with Henley Paper at Works 54 (Chester) provides for once-a-month billing, which consists of one purchase order and one invoice per month. In addition, there is an average of 27 issues and 33 receipts processed per month.

Purchase orders:

Personnel cost X purchase order = (\$40.94 X 1)	\$ 40.94	
Personnel cost X issues = (\$2.00 X 27)	<u>54.00</u>	
		\$ 94.94

Receipts: Average 1.5 receipts per purchase order.

Personnel cost X 1.5 purchase orders (\$1.12 X 1.5) =	\$ 1.68	
Personnel cost X 1.5 issues (\$1.12 X 40.5) =	<u>45.36</u>	
		<u>\$ 47.04</u>

Total Works 54 transaction personnel costs		\$ 141.98
--	--	-----------

CHEMCENTRAL -- Calculations for Table 4**COMPUTER SYSTEM COSTS OF TRANSACTION ACTIVITIES****Works 52**

Monthly transaction computer system costs are calculated by averaging the number of each type of transaction over the first three months of operation at Works 54 (total of 24 purchase orders, 25 invoices, and 25 receipts) and multiplying each of these by the computer system cost factor. Because there are no American Express charges, only the manual invoice cost factor is used.

Purchase orders:

System cost X purchase orders ($\$5.81 \times 8$) = \$ 46.48

Invoices:

System cost manual invoice X invoices ($\$3.65 \times 8$) = 29.20

Receipts:

System cost X purchase orders ($\$5.81 \times 8$) = \$ 46.48

Total Works 52 transaction computer system costs \$122.16

Works 54

The agreement with ChemCentral at Works 54 (Chester) provides for once-a-month billing, which consists of one purchase order and one invoice per month.

Purchase orders:

System cost X one purchase order = ($\$5.81 \times 1$) \$ 5.81

Invoices:

System cost manual invoice X invoice = ($\$3.65 \times 1$) 3.65

Total Works 54 transaction computer system costs \$ 9.46

CHEMCENTRAL -- Calculations for Table 4**PERSONNEL COSTS OF TRANSACTION ACTIVITIES****Works 52**

Monthly transaction personnel costs are calculated by averaging the number of each type of transaction over the first three months of operation at Works 54 (total of 24 purchase orders, 25 invoices, and 25 receipts) and multiplying each of these by the transaction personnel cost factor.

Purchase orders:

Personnel cost X purchase orders (\$40.94 X 8) =	\$ 327.52
--	-----------

Receipts:

Personnel cost X receipts (\$1.12 X 8) =	<u>\$ 8.96</u>
--	----------------

Total Works 52 transaction personnel costs	\$ 336.48
--	-----------

Works 54

The agreement with ChemCentral at Works 54 (Chester) provides for once-a-month billing, which consists of one purchase order and one invoice per month.

Purchase orders:

Personnel cost X one purchase order = (\$40.94 X 1)	<u>\$ 40.94</u>
---	-----------------

Total Works 54 transaction personnel costs	\$ 40.94
--	----------