IPRO 346

Engine Flywheel Market Research and Business Strategy

Final Report

Team Members:
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1. Abstract:

IPRO 346 was sponsored by DACO Inc., a precision machining company based in the Chicago area which specializes in flywheel manufacturing. We were to research new products and potential customers for the company. A wide variety of products and markets were analyzed, and two recommendations were made for DACO Inc. to pursue. The first opportunity was in providing steel flywheels to manufacturers of mechanical batteries. The second recommendation was to enroll in several government programs which provide contracts to small businesses. Through these same programs, DACO would also be able to subcontract with larger government contractors.

2. Background:

DACO Inc. was founded as a car dealership in 1930, and was known then as Dewey and Company. By 1957, the company had converted completely into a machining company, and the name was changed to DACO Incorporated. Today, DACO is a large producer of cast iron flywheels, and produces 100 % of the flywheels for Caterpillar's North American operations. They also produce other precision machined products, such as pulleys and input flanges, on a much smaller scale.

IPRO 346 was sponsored to improve DACO's customer base. With the current economy, DACO wanted to expand to have a number of different customers, rather than have a single company account for over 80 % of their sales.

DACO Inc utilizes modern technology in their day to day operations. A significant portion of their machining process is automated, which makes it easy to adapt to new products,

especially precision turned products. They have the full capability of turning, machining, and balancing a variety of different size steel disks. They also have heat treating and painting operations which are currently used for input flanges, but could be adapted to other products.

IPRO 346 is the first known effort to expand DACO's product line and customer base, so there were no previous attempts that could guide our research.

3. Objectives:

There were three main objectives for IPRO 346. These objectives are explained in detail below

1. Research new products for existing customers:

It was decided that research should be done into new products that could be produced for existing customers. DACO already had contacts within these companies, so marketing would be simplified. However, this would not provide the increase in customer base.

2. Find new customers for current products:

DACO was more interested in this objective, as it would help them expand their market, and reduce their dependence on Caterpillar. Much of our time was focused on finding new companies interested in buying DACO's flywheels, as well as finding potential products requiring flywheels.

3. Develop new products for new customers:

This objective was to find new products that were within DACO's manufacturing capabilities. Once potential products were discovered, we were to do market research into the salability of these items.

4. Methodology:

At the beginning of semester, we started with brainstorming, and each idea was assigned to a group member. Each member had approximately two weeks for the initial research on the specified product. After that, everyone had to report the results of the research, and we narrowed down our research based on the results. We decided to focus on three main products: flywheel batteries, government contracting, and clutch plates. Subgroups were formed to do more in-depth research for each of the specified products.

Each subgroup concentrated on collecting as much information as possible on their specific products, as well as finding companies which are currently in this business. After compiling a list of companies which were already making our target products, each member of the group was responsible for contacting several of the identified companies. The aim of this activity was to get information about the market conditions, and find more specific information on the products. We analyzed whether these identified markets had growing potential and business opportunities for DACO Inc.

This secondary research was then presented to our client. We had a DACO representative visit our class, and we used this opportunity to get feedback on our findings. After this meeting, we decided against further research into clutch plates because of the many companies already manufacturing clutch plates. Also, clutch plates would give DACO only a marginal increase in customer base, as many of their parts are already used in vehicles. Based on DACO's

suggestions, the clutch plate group was reassigned to wind turbines. This group pursued windmills while the other two groups finalized their research into mechanical batteries and government contracting. Finally, windmills were eliminated, because the majority of the parts were outside of DACO's manufacturing capabilities.

5. Team Structure and Assignments:

Initial Organization:

- **Michael Tishler:** Railway wheels - Medical
- **Hasan Hasan:** Rotors
- **Kara Wilke:** Gyroscopes
- **Eric Hamann:** Windmills – Bushings – Medical
- **Zack Phillips :** Flywheel Batteries – Transmissions – Gears
- **Tim Lipman:** Military
- **Jay Park :** Clutch Plates
- **Dan Coughlin:** Abrasive Grinders – Sprockets
- **Jelena Milkic:** Fifth Wheels

Final Organization:

- **Flywheel batteries:** Michael Tishler, Jelena Milkic, Zack Phillips
- **Clutch Plates / Wind Turbines:** Hasan Hasan, Kara Wilke, Jay Park
- **Government Contracting:** Eric Hamann, Tim Lipman, Dan Coughlin

Deliverables:

- **Project Plan:** All members
- **Minutes:** Kara Wilke
- **Midterm Presentation**: Eric Hamann, Kara Wilke, Michael Tishler, Zack Phillips

- **Abstract:** Kara Wilke
- **Poster:** Jay Park, Hasan Hasan, Kara Wilke
- **Final Presentation:** Michael Tishler, Zack Phillips, Dan Coughlin
- **Final Report:** Eric Hamann, Tim Lipman, Jelena Milkic

In the flywheel batteries group, Zack Phillips provided the initial research into flywheels. Based on his information, the market was chosen as one of the final three topics. He also contacted two companies, and obtained information on the manufacturing processes involved. Michael Tishler was responsible for contacting the company Active Power. He had great success with this task, providing the group with valuable information on flywheels, and even found a potential business opportunity for DACO. Jelena Milkic also had a success in making initial contact with her company, Tribology Systems. She spoke to the owner, and found the opportunity for our client to buy intellectual property and expand their business.

For the clutch plates group, Jay Park did online research and called companies for initial information about clutch plates. Hasan Hasan contacted several companies, and found that the current market situation is not beneficial for our client. With the info he provided we were able to eliminate clutch plates as possible product for our client. Kara Wilke also contacted several companies about their clutch plate production

In the government contracting group, Tim Lipman performed the initial research, with a focus on the military and specific products that could be produced. When this was chosen as one of the final three topics, it was expanded to include all small business contracting through the federal government, including military. Eric Hamann focused on the process of obtaining government contracts and the requirements for qualifying as a small business. He located several jobs archived on the Federal Business Opportunities website which were within DACO's

manufacturing capabilities. Tim Lipman also researched the process of obtaining government contracts, and he attempted to contact several companies that had won government contracts. However, none of the companies he contacted were willing to provide information on the process. Dan Coughlin did additional research on possible products. He also went to a free seminar on small business contracting, which confirmed our online research.

6. Budget:

The original proposed budget for IPRO 346 was $1470, with $1170 being approved. However, most of this money ended up being unnecessary. The only expenditures of IPRO 346 were for food and travel, as follows.

IPRO 346 Final Budget			
Event	**Team Member**	**Details**	**Cost**
Travel (At $0.585 per mile)			
First Daco Visit			
	Mike Tishler	135 miles	78.97
	Hasan Hasan	84 miles	49.14
	Jelena Milkic	40.8 miles	23.86
Government Contracting Seminar			
	Dan Coughlin	30 miles	17.55
Final Daco Visit			
	Mike Tishler	135 miles	78.97
	Jelena Milkic	40.8 miles	23.86
	Dan Coughlin	80 miles	46.8
Total Travel Expenses		515.6 miles	319.15
Food			
Daco Visit to IIT			
	Zack Phillips	Dominoes Pizza	55
Final Class Meeting			
	Hasan Hasan	Dominoes Pizza	39
Total Expenses			413.15

7. Code of Ethics:

A. Overarching Standard

1. Help our sponsor, Daco Inc., perform market research into possibilities for the company's future without disclosing any proprietary information.

B. 7 canons

1. **Law**

    i. **Canon:** Sensitive information about Daco or any other companies from which we gathered information must not be disclosed, especially about copyright or patent information.

    ii. **Pressure:** If talking about the project with a different company, a member may feel it might be beneficial to share confidential information.

    iii. **Pressure:** Not sure which information is confidential and which information can be shared.

    iv. **Risk:** Copyright infringement or we might lose contact with companies if they lose trust in us.

    v. **Measure:** Talk about information as a group and decided what can and cannot be shared with other parties.

2. **Contracts**

    i. **Canon:** The group will be sensitive to any contracts or agreements in the industry that are already in place.

    ii. **Pressure:** Unaware of any contract or agreement.

    iii. **Risk:** Breaking an agreement between two companies.

    iv. **Risk:** Ruining a chance of business between Daco and another company by asking for information about supplies that can't be supplied.

    v. **Measure:** Discuss as a class issues that come up and ways to solve them ethically. If a member is unsure, they will not continue until the issue has been resolved

3. **Professional codes**

    i. **Canon:** The group will be aware of all training and education that is needed to get into a specific industry, and will be sure to make Daco aware of those requirements.

    ii. **Pressure:** Time limiting ability to research properly the training or education needed in a specific industry.

    iii. **Risk:** Daco not being certified to get into a certain industry based on lack of research by our group.

    iv. **Risk**: Daco not being accepted by any professional entity and not getting a proper license.

    v. **Measure**: We contact companies in the industry we are looking at and asking about certification and training needed, as well as taking the time to do research.

4. **Industry Standards**

    i. **Canon**: To follow all standards set in any industry we look into for a possibility for Daco.

    ii. **Pressure**: Generally unwritten, so it may be hard for students without knowledge of the industry to know the standards.

    iii. **Risk**: Enter Daco into an industry that the standards are unknown.

    iv. **Risk**: Daco not being accepted by the potential industry groups.

    v. **Measure**: If an audit agency does not penalize Daco after entering the industry.

5. **Community**

    i. **Canon**: To protect the community of Daco by not entering into potential dangerous industries or products.

    ii. **Pressure**: Not finding an industry or product within the geographical region.

    iii. **Pressure**: Having a time deadline that affects the group's effort

iv. **Risk**: Daco not being accepted by the community because of the avenue they chose.

v. **Measure**: If the general public accepts the choice and doesn't give bad reviews.

6. **Personal relationships**

i. **Canon**: The group will do their best to work together and communicate honestly.

ii. **Pressure**: Other coursework getting in the way of IPRO projects.

iii. **Pressure**: Students not taking IPRO seriously.

iv. **Risk**: False data being presented to Daco and IPRO office.

v. **Measure**: All students will try to use iGroups to help communicate and post their sources to help show honesty in their work.

7. **Personal/moral values**

i. **Canon**: If a member has personal or moral objections to any actions taken by the group, they will not be required to do that.

ii. **Pressure**: If availability of group and Daco is on a holiday or religious event

iii. **Pressure**: Not having enough participants for a test or group meeting to Daco

iv. **Risk**: May force an objector to do something they are uncomfortable with or that conflicts with a personal or moral event.

v. **Measure**: All dates and events are asked for availability, so as to give each member a chance to share times not available for personal or religious reasons.

8. Results:

Many different products were researched, but with our findings and input from DACO, most of the potential products were eliminated in order to focus on the most promising options. Most of the in-depth research was focused in two areas.

1. Flywheel Batteries

In essence, a flywheel battery is simply an electric motor attached to a shaft and a flywheel. Electrical energy is converted to mechanical energy by the motor, which causes the internal flywheel, or flywheels, to spin. If some form of low loss bearings are used, this energy can be stored in the flywheel very efficiently, for long periods of time. This energy can be converted back to electrical energy by the motor.

Flywheel batteries have a number of advantages over conventional chemical batteries. Depending on the bearings (most are magnetic or specialized ceramics), most mechanical batteries store energy with significantly less loss over time. In addition, they can be charged and discharged very quickly without damaging the battery. This is not possible with standard chemical batteries, which must be charged and discharged within certain rates. Temperature also has a large effect on chemical batteries. High or low temperatures reduce the battery life significantly, while temperature extremes have no effect on flywheel batteries. Traditional chemical batteries must be replaced every 1-3 years, while flywheel batteries have an estimated life of 20 years, with minimal maintenance.

We believe this is a growing market. Flywheel batteries are a green energy storage method, and are often used in conjunction with wind turbines, which is also a growing industry. They are used primarily by large industrial centers as a backup power supply for critical processes. They

can store a large amount of power, and continue running important processes until they can be shut down, without the need for a polluting combustion generator.

One problem we encountered was that a number of manufacturers of flywheel batteries have switched from steel to carbon fiber for higher performance batteries. Most of the companies that use carbon fiber flywheels have equipment to manufacture and machine their own flywheels. However, because of the much higher cost of carbon fiber flywheels, many companies still use steel as a less expensive alternative.

Besides recommending this industry to DACO, we also located two specific opportunities. We were able to contact Active Power Inc, and spoke to their Vice President of business development and their Vice President of Engineering. Both seemed very interested in having DACO do the machining and balancing of their flywheels. In addition, we were able to contact the President of Tribology Systems. He informed us that, while they were not interested in purchasing our flywheels, they were looking for a buyer for their mechanical battery patents. These batteries require several parts that DACO does not have the current capability of manufacturing. However, DACO could subcontract these parts to other companies, and sell the batteries under their name. Alternatively, they could attempt to market their flywheels to the company that purchases the patents.

2. Government Contracting

The second topic was small business contracting through the Federal government. We discovered that most of the products DACO manufactures fall under North American Industry Classification System (NAICS) number 332721, for precision turned product manufacturing. To

be qualified as a small business, a company under this code must have fewer than 500 employees. DACO Inc fits in this category very easily.

The Federal government has many programs for aiding small businesses. Most government contracts between $25,000 and $100,000 are specifically reserved for small businesses. We presented the application method to DACO as follows.

The first step to obtaining a small business government contract is to apply for a DUNS number, which DACO had previously done. The next step was to register in the Central Contractor Registration (CCR) database. To register, they also needed to complete the Online Representations and Certifications Application (ORCA). After these steps, there are a number of opportunities.

Registration in the CCR allows government officials to contact the company with specific job opportunities. It also allows online bidding on contracts with several government departments, including military branches, through the Federal Business Opportunities website. Finally, registered companies can also bid on subcontracting opportunities from larger government contractors through the Small Business Association Sub-Net.

Due to time constraints and the sensitive information required for CCR registration, we were not able to assist DACO in finding specific opportunities. However, we were able to find numerous completed jobs in the recent archives which DACO had the capability to perform. Therefore, we are confident that DACO will be able to find a new market through the information we provided.

Both of these results focus mostly on the second objective of finding new customers for existing DACO products. This objective was the most useful for our goals, because it allows for the expansion of DACO's customer base without requiring significant investments in new

equipment. The government contracting can also somewhat satisfy the third objective of finding new products for new customers. DACO will be able to bid on jobs that are in areas they are interesting in expanding to. The first objective, finding new products for existing customers, was not addressed in our results. However, this was the objective DACO was least interested in, because it would not expand the customer base. In addition, DACO already had communication with their current customers, and did not believe they were interested in expanding their purchases from DACO.

9. Obstacles:

B. Obstacles we faced

1. Many obstacles were encountered during our project. In the first half of the semester, we encountered many problems prior to meeting with Daco Inc (our sponsor). We did not have enough information about the company to do full research into possibilities for the Daco, and we were unsure about what the client wanted from us. Our IPRO group also came up with many different products as possibilities for Daco, but without much information from them, we could not do in-depth research. Since we could not do in-depth research, we were unable to narrow down our options early on, which created a delay in progress of final options for Daco. Another obstacle we faced early on was communications issues with members not using iGroups enough or finding times for everyone to meet outside of class. Another early obstacle was lack of student leadership within the group, most of the leadership/direction was provided by the instructor.

2. Once we eliminated some of the options for Daco, we had a few options that people looked into. We faced many obstacles within those 3 groups when doing research. Many of the group members pursued information from specific companies in their respective industries of research. While pursing these companies, many members had issues while contacting companies. For example, within the flywheel battery group a total of 9 companies were investigated but only 3 or 4 were contacted. Within those 3 or 4 companies, only 2 seemed interested in providing information to us. This was common across the whole group because many companies didn't want to talk with college students or provide vital company information. A similar obstacle was

not being able to get in contact with the company at all, due to online submission forms not being replied or an employee not at their desk and leaving a voicemail, with no response.

3. The military group ran into obstacles after meeting with Daco. The recommendation to Daco was to register for a website which allows them to bid on contracts posted by different government departments. The main obstacle this group ran into was that in order to view opportunities posted a login was required. When Daco came to visit, we asked them to register, but nothing has been shared with the military group to-date. This created a huge obstacle for the group because no more progress could be made helping Daco look for bids from government departments.

C. How we overcame those obstacles

1. The main way we overcame the first obstacle was by meeting with Daco and finding out their capacity and where they would like our group to focus research. We discussed and toured their facility and in turn gained knowledge that helped us overcome our obstacle of not having enough information about the company. The communication issue has been addressed, but not fully resolved. Our sub-groups are communicating more effectively and information is being communicated. Email is the only aspect that still proves to be an issue. As far as not enough student leadership, certain students took charge of the sub-groups and help to make sure things were organized.

2. The next big hurtle that our group overcame was gathering information from companies. The main way we overcame this obstacle was to "smile and dial." This was the motto given to us by the instructor to represent what must be done to get information from companies (smiling and then dialing the company to make sure we sounded happy and willing to get information). While this method was useful, it did not produce any results. While we did get a hold of a few companies, many other companies never responded. After an exhausting number of phone calls, we decided we had enough information to stop contacting other companies, thus this obstacle was never fully resolved.

3. The military group has not yet been able to overcome the obstacle of registration. The only solution we have is to highly recommend that Daco registers for this website. Other than that, this obstacle cannot be overcome.

D. What could have been done to prevent those obstacles

1. The main thing that could have been done to prevent any obstacle was clearer communication between students and letting the students collaborate and

determine the steps to take. Another item that could have prevented obstacles is to have a pre-set date for a sponsor (ours is Daco Inc) to come to a meeting toward the beginning of the semester to discuss what they expect out of the IPRO and provide a little background. This could have saved time in the beginning by eliminating much of the unknown by the members. Another thing that could have been done to help prevent some of the obstacles is providing a clear communication channel between the sponsor and the IPRO that will be checked regularly by the sponsor. This would eliminate time wasted waiting for a response and allow the group to move on faster.

E. Remaining barriers that need to be addressed

1. The main barrier faced by the group is not having log-in information to the website for government contracts. The proposed solution is to contact Daco and see what their plans are. They may choose not to follow this recommendation, but that decision needs to be made clear to the group, so as not to waste time.

10. Recommendations:

Based on our results, we made two major recommendations to DACO Inc. The first was to continue to pursue small business government contracting, using the online resources we discovered. The second recommendation was to attempt to move into the mechanical battery market, and to continue correspondence with Active Power Inc. Finally, we suggested that DACO improve their website, with the intent of attracting potential customers through it.

11. References:

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12. Resources:

Because the majority of our IPRO consisted of individual or small group research, with the results being presented to the group, we decided against keeping a detailed log of time spent on individual tasks, and instead focused on the results obtained. We believe this allowed us more freedom to research a wider variety of topics, and was thus beneficial to our goal. Likewise, since the deliverables were divided among all of the team members, and were reviewed by the group as a whole, no time logs were kept for those tasks. All of our expenditures were detailed

in the budget, with the team members listed providing transportation for the rest of the team to DACO Inc facilities.

13. Acknowledgements:

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