

Market Progress Evaluation Report
MagnaDrive, No. 1

prepared by

**Quantec with:
Market Link Strategies, Schiller Associates and XENERGY**

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Final Report

Market Progress Evaluation Report for MagnaDrive, No. 1

Prepared for:
The Northwest Energy Efficiency Alliance

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In Association with:
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Table of Contents

Executive Summary	ES-1
Introduction.....	ES-1
Phase 2 Evaluation Approach	ES-2
Findings and Recommendations to Date	ES-2
I. Introduction.....	I-1
Background.....	I-1
Report Structure	I-3
II. Evaluation Approach.....	II-1
Task 1: Kickoff Meetings and Work Plan Revisions.....	II-1
Task 2: Characterization of the Speed Control Market (Update)	II-2
Task 3: Assessments of Current Practices, Attitudes, and Awareness	II-3
Task 4: Review MagnaDrive Marketing Materials and Activities	II-4
Task 5: Review and Analysis of MagnaDrive Energy and Non- Energy Benefits.....	II-5
III. Customer and Non-Customer Interviews.....	III-1
Overview.....	III-1
Interview Design.....	III-2
Findings from Water & Wastewater Treatment Industry	III-4
Findings from the Pulp & Paper Industry	III-10
Summary of Customer Interview Findings.....	III-14
IV. Market Potential Update.....	IV-1
Background – Phase 1 Market Characterization.....	IV-1
Market Potential Update Approach	IV-2
Market Potential Summary	IV-8
V. Marketing and Promotional Materials Assessment	V-1
Background.....	V-1
Distribution of Adjustable Speed Drives and Purchasing Processes	V-3
Marketing to the Water and Wastewater Treatment Industry: Lessons Learned from the WEFTEC Tradeshow	V-5
Summary of Findings.....	V-10
Appendix A. Interview Instruments	A-1

Executive Summary

Introduction

This Market Progress Evaluation Report (MPER) is the first of three progress reports that will be prepared by the **quantec** team over the course of this assignment. It covers research and analysis conducted between August 15 and November 15, 2000.

The Northwest Energy Efficiency Alliance (Alliance) and the MagnaDrive Corporation (MagnaDrive) have formed a public/private partnership to help commercialize the MagnaDrive Coupling. The MagnaDrive Coupling is an innovative speed control device that transmits torque through an air gap by using powerful permanent magnets. The MagnaDrive Corporation and the Alliance have been working together since May 1999. Phase 1 of the project involved a number of tasks that included the testing and comparison of the coupling to variable frequency drives (VFD), control valves, and dampers at Oregon State University's Motor Systems Resource Facility (MSRF), development of case studies of coupling installations at four industrial sites, and a market assessment study.

The findings from Phase 1 concluded that the MagnaDrive is viable as a simple, non-electronic, adjustable speed drive (ASD) that provides on average two thirds of the energy savings of a comparable VFD and can be used in many applications where an ASD is not cost-effective. The MagnaDrive also offers a number of benefits that will support its growth in the speed control market – potentially lower costs in larger motor sizes, mechanical operating advantages, and the avoidance of electrical problems.

However, three key market barriers were identified in Phase 1:

1. Lack of in-field performance data
2. Lack of knowledge about the coupling as a product and technology
3. Lack of brand recognition in the marketplace of both the MagnaDrive coupling and the Corporation

Still, the overall findings from Phase 1 have led the Alliance to fund a second phase research effort designed to address these barriers. The primary goals of Phase 2 are to:

- Increase sales in the markets pursued in Phase 1 (pumps, fans and blowers; pulp & paper; water & wastewater treatment, and HVAC)
- Expand the coupling into new target markets (larger motors 500 to 1000+ HP, medium- and high-voltage equipment, and irrigation)

The Alliance has established certain progress indicators it will use to gauge the success of the Phase 2 effort:

- Greater awareness among market actors about ASDs in general and the MagnaDrive in particular
- Identifying and/or confirming market barriers and opportunities
- Increase the market penetration of the MagnaDrive coupling
- Examining the overall impact of the Phase 2 effort on the ASD market (e.g. competitive responses, pricing, and any technology improvements)

Phase 2 Evaluation Approach

The Alliance desired that the **quantec** team conduct a very specific set of activities for this evaluation effort:

- Review all MagnaDrive and Alliance materials
- Conduct surveys, interviews, and perform data collection
- Provide updates of the market potential for the MagnaDrive coupling
- Assess the project's marketing approach
- Assess the market impact resulting from this initiative
- Track progress toward the continued market adoption of motor speed control technologies and applications

Findings and Recommendations to Date

Customer and Non-Customer Interviews

The **quantec** team conducted interviews with a number of customer purchasers and non-purchasers to assess current practices, attitudes, and awareness of the MagnaDrive and the speed drive market. Interviews were conducted primarily with members of the wastewater treatment (WWT) and pulp and paper (P&P) industries.

The interviews also asked WWT and P&P representatives about the distribution of motors by size at their facilities. This information was used to develop the market potential estimates for higher voltage / larger motors where MagnaDrive has a cost advantage. The most important finding from this research is provided below; industry-specific findings follow.

- Customers in both sectors appear to be fairly selective when making capital purchase decisions. Initial sales do not appear to lead a customer to decide to install couplings on every pump and fan application. Instead, customers appear to be making purchase decisions on an application- by-application (or motor-by-motor) basis.
- This suggests that that the purchase decision in many facilities may need to be measured in years. This time-to-market issue should be considered in MagnaDrive's marketing and distribution plan.

Water and Wastewater Treatment

The water and wastewater treatment (WWT) industry is considered to be conservative in installation of new technologies. However, the sector generally has good perception of adjustable speed drives and is interested in new speed control technology as indicated by the much higher VFD penetration in the newer plants and the plants that had recent upgrades and renovations.

The following points summarize the key findings and recommendations from the WWT interviews:

- Non-energy benefits often outweigh first costs and energy savings in customer decisions. There are situations where the inherent characteristics of the MagnaDrive give it an advantage over VFDs, even when first costs are higher and energy savings are immaterial.
- Respondents indicated that payback and life cycle cost analyses are performed when purchasing motors and motor drives. Some respondents indicated that first costs are also important in decision-making. Energy efficiency is also a important purchasing criterion, but process-related issues such as load balancing and vibration can outweigh efficiency in decision-making.
- Most of the purchasers' reactions to the technology were very positive. All respondents gave the technical concept of the MagnaDrive high marks and reported that the unit appeared to be professionally designed and manufactured.

- Most buyers felt that the units delivered on their promises, but there were some surprising performance shortfalls. Noise and heat were mentioned by a few end users. *Increased* energy consumption was a complaint of one user, but we believe it is likely that this finding is really the result of a flawed measurement approach.
- The most important litmus test, however, was customer interest in installing another drive. More than half of the buyers reported that they had already purchased another MagnaDrive, while others said they were likely to purchase another MagnaDrive.
- MagnaDrive will need to focus more on educating WWT engineering firms about their products.

Pulp and Paper

The P&P industry is also very conservative. Reliability is typically a more important equipment/process improvement criterion than cost. Any new product will be initially viewed as a potential liability until its reliability can be verified and its benefits clearly identified.

The following points summarize the key findings from the P&P interviews:

- Several types of costing analyses are performed prior to capital purchases, and these are not necessarily consistent from facility to facility. A fairly simple analysis (e.g. simple payback) is performed for smaller motor systems. For larger motor systems, a more complex analysis such as life cycle costing is usually performed.
- Most of the respondents indicated that energy efficiency is included in the decision-making criteria.
- There is interest in obtaining variable speed control for more P&P process motors. The fact that reliability is so important for them – much more important than energy efficiency – and that there is low overall VFD penetration suggests that there is significant potential for MagnaDrive applications.
- Generally, the people interviewed are satisfied with their existing VFDs. However, the low penetration level – especially for high horsepower equipment – provides ample opportunity for MagnaDrive to enter the marketplace, if they can produce a relatively inexpensive product.
- Our interviews with P&P firms indicated that MagnaDrive will need to work through normal equipment distribution channels to gain a significant foothold in this industry.

Market Potential Update

The Phase 1 Market Characterization Assessment Study (Study)¹ provided estimates of variable load applications suitable for MagnaDrive under the three scenarios (most optimistic, middle ground, and least optimistic). Motors under 50 HP were excluded from the analysis because the costs of the MagnaDrive were higher at that time than ASDs. The findings suggested that MagnaDrive had the potential to reach an annual market ranging from \$20 to \$80 million across these scenarios by 2004, which would represent 5% to 20% of the U. S. adjustable speed drive market above 200 HP.

The **quantec** team reviewed the Study as part of this Market Potential Update, and we believe it provided a very good “top-down” breakdown of the motor market by size, sector, and application. Our discussions with the MagnaDrive Corporation indicated that, while the Company found value in much of the information, they were looking for a different focus in this update:

- Northwest-specific “market intelligence”
- A broader focus that would include all motor HP sizes

Our update approach involved developing a “bottom-up” analytical inputs from our WWT and P&P interviews, and combining these with more recent Northwest-specific motor data collected by the Alliance in a related industrial study.

Summary of Update Findings

- While there are 825 WWT plants and 40 P&P plants in the Pacific Northwest, there are only a small number of very large customers in both of these industries. However, nearly all of these customers have motor applications that can benefit from the MagnaDrive Coupling.
- Of the 825 WWT plants, about seventy have design flows of over five million gallons per day (MGD), and about 20 have design flows of over 20 MGD. These are responsible for most of the energy consumed by the sector, and the probability of the plant having medium voltage applications will be greater as the size of the plant grows.
- MagnaDrive’s annual Northwest WWT sales could range from approximately \$1 to \$8 million (approximately 100 to 1,000 units)

¹ Market Assessment and Marketing Strategy for the MagnaDrive ASD, A New Speed Control Technology, Easton Consultants and XENERGY, January 24, 2000.

per year), and the total domestic annual market potential ranges from \$25 million to \$200 million. The most likely candidates for medium and high voltage applications are plants with activated sludge facilities and with flow rates above 5 million gallons per day.

- There are forty P&P plants in the Pacific Northwest, and eleven of these make up the bulk of the production. All of these plants have a large number of motors and almost all have large horsepower MV applications.
- In the P&P industry, we estimate that the market potential for the coupling in Northwest facilities ranges from \$3 million to \$18 million annually. This represents coupling sales ranging from 200 to nearly 3,000 units annually. We estimate that MagnaDrive's domestic P&P annual market potential ranges from \$30 million to \$180 million. There are about 40 facilities in the Northwest that are all good targets each having a large number of motors and most having medium voltage applications. Most of the companies also have sites in other regions of the country, which will facilitate additional sales over time.
- The range of potential sales estimates for the Northwest translates into an energy savings potential ranging from about 70 to nearly 700 GWh annually. Note that this is a *cumulative* savings estimate reflecting several years of coupling installations.

Marketing Review and Promotional Materials Assessment

MagnaDrive identified the WWT market segment as one of its primary target segments. The company planned and operated a booth at WEFTEC, the leading US-based industry trade event for the water and wastewater industries, that provided demonstrations to a targeted and informed audience.

WEFTEC participants made varying communication and promotion commitments to the show. Market leaders had displays covering in the thousands of square feet, with complex demonstrations, planned media events and technical paper presentations, as well as well-manned booths, four-color brochures, marketing collateral (“take aways”) like bags, pens, and other items.

MagnaDrive exceeded the minimum corporation communication and market promotion threshold, and designed and developed world-class components of a total communication package. Corporate logos, letterhead and stationery, the display booth, the truck demonstration, show ‘uniforms,’ technical product descriptions, etc., all reached or exceeded market requirements.

The MagnaDrive demonstrations, which included both truck- and table-mounted units, were well attended and credibly presented. The corporate logos, letterhead, equipment spec sheets, representative ‘booth uniforms,’ personnel selling style, and brochures were well received.

MagnaDrive’s sales organization was friendly, enthusiastic, and positive regarding the product and its capacities. The company’s professional sales skills are very good.

Summary of Findings

- For MagnaDrive’s stage of development, additional investment in market promotion should be focused on lead generation, trade show participation, and providing selling tools to direct and channel marketing partners.
- In certain sectors, third party endorsements (e.g., engineering firms, case studies, trade journal articles) are a key aspect of educating prospects.
- MagnaDrive’s greatest marketing challenge, as identified in the company’s business plan, is developing US distribution.
- The executive team at MD is very aware of and very expert at understanding and implementing corporate communication requirements.
- Time to market is a significant issue facing MagnaDrive. The Coupling is a capital item and most public and private sector prospects have lengthy (e.g., annual) capital budget cycles, and the public sector prospects (i.e., WWT) face significant budgetary constraints.

I. Introduction

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Background

The Northwest Energy Efficiency Alliance (Alliance) and the MagnaDrive Corporation (MagnaDrive) have formed a public/private partnership to help commercialize the MagnaDrive Coupling. The MagnaDrive Coupling is an innovative speed control device that transmits torque through an air gap by using powerful permanent magnets. These rare-earth permanent magnets (Neodymium-Iron-Boron) are combined with a mechanical, adjustable-speed coupling system that allows a load to be mechanically disconnected from its prime mover. As a consequence, load speed can be more accurately controlled and less electricity is consumed.

MagnaDrive Corporation, located in Seattle, Washington, is engaged in the development and commercialization of patented torque transfer technology with applications in industry, public works, transportation, and consumer products domestically and internationally. The Company's basic product is the MagnaDrive Coupling. The Alliance is a non-profit group of electric utilities, state governments, public interest groups, and industry representatives committed to bringing affordable, energy-efficient products and services to the marketplace.

The MagnaDrive Corporation and the Alliance have been working together since May 1999. Phase 1 of the project involved a number of tasks that included the testing and comparison of the coupling to variable frequency drivers (VFDs), control valves, and dampers at Oregon State University's Motor Systems Resource Facility (MSRF),² development of case studies of coupling installations at four industrial sites, and a confidential market assessment study. The findings from Phase 1 concluded that the MagnaDrive is viable as a simple, non-electronic, adjustable speed drive that provides on average two thirds of the energy savings of a comparable VFD and can be

² Product Testing: Magna Drive, Report No.1, Motor Systems Resource Facility, Oregon State University, March 2000 (Alliance Report #00-048).

used in many applications where an adjustable speed drive (ASD) is not cost-effective. The MagnaDrive also offers a number of benefits that will support its growth in the speed control market – potentially lower costs in larger motor sizes, mechanical operating advantages, and the avoidance of electrical problems.

However, three key market barriers were identified in Phase 1:

1. Lack of in-field performance data
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3. Lack of brand recognition in the marketplace of both the MagnaDrive Coupling and the Corporation.

Still, the overall findings from Phase 1 have led the Alliance to fund a second phase research effort designed to address these barriers. The primary goals of Phase 2 are to:

- Increase sales in the markets pursued in Phase 1 (pumps, fans and blowers; pulp & paper; water & wastewater treatment, and HVAC)
- Expand the coupling into new target markets (larger motors 500 to 1000+ HP, medium- and high-voltage equipment, and irrigation)

The Alliance has engaged **quantec** to conduct an evaluation that will track MagnaDrive Corporation's progress toward these goals. To accomplish this, **quantec** formed a project team (the **quantec** team) comprised of economists, engineers, and marketing experts from MarketLink Strategies, Schiller Associates, XENERGY, and **quantec** staff.

The Alliance has also established certain progress indicators it will use to gauge the success of the Phase 2 effort:

- Greater awareness among market actors about ASDs in general and the MagnaDrive in particular
- Identifying and/or confirming market barriers and opportunities
- Increase the market penetration of the MagnaDrive Coupling
- Examining the overall impact of the Phase 2 effort on the ASD market (e.g. competitive responses, pricing, and any technology improvements)

Report Structure

The next section of this MPER (Section II) discusses our overall evaluation approach and the changes and enhancements that we have made based on the project kickoff meetings and subsequent discussions with the Alliance and MagnaDrive Corporation. Section III summarizes the findings from our interviews with Phase 1 customers and non-customers. The fourth section provides an update of Phase 1 Market Assessment Study's market potential in the Pacific Northwest and focuses on a "bottom up" estimate for the region's WWT and (P&P) industries. Section V summarizes the steps the **quantec** team has taken with the MagnaDrive Corporation to develop a Marketing Plan and reviews MagnaDrive's promotional materials from within this overall marketing strategy.

II. Evaluation Approach

The Alliance desired that the **quantec** team conduct a very specific set of activities for this evaluation effort:

- Review all MagnaDrive and Alliance materials
- Conduct surveys, interviews, and perform data collection
- Provide updates of the market potential for the MagnaDrive coupling
- Assess the project's marketing approach
- Assess the market impact resulting from this initiative
- Track progress toward the continued market adoption of motor speed control technologies and applications

To complete the Alliances' objectives and desired activities, the **quantec** team developed a detailed work plan with five major tasks.

Task 1: Kickoff Meetings and Work Plan Revisions

The **quantec** team met with Alliance and MagnaDrive staff in August and September of 2000 to present our draft research plan, review the project's goals, and finalize the schedule, approach, management plan, and deliverables. The descriptions for Tasks 2 through 5 incorporate modifications to our work scope based upon these group meetings, as well as one-on-one discussions between the **quantec** team and Alliance and MagnaDrive staff.

We had group and individual discussions with ten people from MagnaDrive's management, marketing, sales, and engineering teams. It was readily apparent to the **quantec** team that MagnaDrive's staff is well qualified. Management has decades of experience in large manufacturing companies. Similarly, both management and staff from sales and engineering bring extensive experience to the firm.

It was equally apparent that MagnaDrive faces some of the typical challenges faced by manufacturing start-ups – the need for a comprehensive marketing plan, the market barriers associated with being a new player, and emerging cut-throat price competition from larger, established competitors, to name a few. Based on these observations, the **quantec** team and the Alliance immediately modified certain aspects of the evaluation approach so as to provide the greatest benefit to both the Alliance and the MagnaDrive

Corporation. This revision applies a logic model approach to the evaluation and recognizes the critical need to provide assistance to the Company while we perform the tasks desired by the Alliance. Significant changes and enhancements to our approach were made in the following areas:

- The market characterization update will provide bottom-up market size estimates of the pulp and paper (P&P) and wastewater treatment (WWT) segments, while simultaneously providing a database of potential Northwest purchasers to MagnaDrive.
- A review of MagnaDrive's marketing approach that includes facilitating a brainstorming/strategy session to help the Company better focus its target markets, delivery channels, products, pricing, and promotions.
- A faster timeline for the identification and quantification of MagnaDrive's non-energy benefits, moving from the fourth quarter 2000 to the first quarter 2001. The goal here is to provide a project evaluation/sales tool to the Alliance and the Company as soon as possible.

The following task descriptions incorporate these and other evaluation approach changes resulting from these meetings.

Task 2: Characterization of the Speed Control Market (Update)

This objective of this task is to review and update previous motor system and VFD research conducted for the Alliance in the Phase 1 Market Assessment Study by Easton Consultants and XENERGY, as well as market research performed independently by/for the MagnaDrive Corporation. The Alliance originally desired information relating to the following market issues:

- Validate or redefine the key market segments and market trends, identify key decision-makers and the decision-making processes.
- Provide a clear understanding of the key market actors involved in the determination of appropriate technologies and processes used in motor systems.
- Assess the existing or potential market share for the MagnaDrive and other competing speed control technologies, as well as an assessment of the potential delivery channels.
- Track key trends in the speed control market such as new technologies, changes in pricing structures, improvements in existing

technology, new entrants, and changes in the level of penetration of speed control applications in motor systems.

Our discussions with MagnaDrive management and staff indicated, however, that a simple market characterization update of the Phase 1 Alliance Study would not be very useful to the company. Comments such as “too broad,” “high level,” and “not enough detail” to be actionable came across repeatedly in separate interviews with MagnaDrive personnel and in an interview with the President of MagnaForce (inventors of the MagnaDrive Coupling). Other specific comments included “not focused enough on the Pacific Northwest,” “not relevant,” and “we need company names, contacts, and potential in the key Northwest segments we’re targeting.”

Moreover, similar motors and motor opportunities research efforts are currently being conducted by the Alliance, and the Alliance indicated that the **quantec** team should focus its efforts on providing market information that would be useful to the MagnaDrive Corporation. Our revised approach to this task, therefore, involves developing a “bottom-up” characterization for the WWT and P&P segments that will produce Northwest-specific potential estimates across motor size ranges that will also be useful to MagnaDrive. The results of this effort are provided in Section IV of this MPER.

Task 3: Assessments of Current Practices, Attitudes, and Awareness

In this task, the **quantec** team is conducting an assessment of current end-user practices, attitudes, and awareness by interviewing members of five distinct groups:

- Participants at demonstration sites
- Those that have purchased the coupling without Alliance co-funding
- Non-purchasers who are familiar with the MagnaDrive
- Non-purchasers who are unfamiliar with the MagnaDrive
- Engineering consultants

The interviews will elicit the following general information across these groups:

- Market sector information
- Project information
- Cost information

- Information about the purchase/not purchase decision
- Comparison with VFDs

Additionally, the interview instruments will vary across the groups to answer the following questions across the groups defined above:

- **MagnaDrive Coupling Purchasers.** Why did end users purchase the coupling? What is their past and current level of use of speed control in motor systems? How satisfied are they with the coupling? How satisfied was the customer with the ordering and installation process? What could be improved? Were there any unexpected or hidden costs?
- **Non-Purchasers.** Why didn't they purchase or why weren't they interested in purchasing the coupling? For those unfamiliar with the coupling, would they be interested? What is their past and current level of use of speed control in motor systems?
- **Engineering Consultants.** What impact, if any, has the MagnaDrive Coupling had on consulting engineering firms' attitudes toward the motor systems and speed control applications? Are they performing both engineering and economic comparisons of the coupling to VFDs?

The findings from our first set of interviews are provided in this MPER. Interviews with engineering firms will be conducted in winter 2000-2001, and our findings will be provided in the second MPER. Lastly, we will interview Phase 2 purchasers and non-purchasers in 2001 (e.g., motors over 500 HP and the irrigation sector). Findings from this last set of interviews will be reported in the third MPER.

Task 4: Review MagnaDrive Marketing Materials and Activities

As originally envisioned by the Alliance, this task had two components: (1) provide an assessment of the comprehensiveness of MagnaDrive's marketing plan as it relates to the market characterization update, and (2) evaluate and document the final marketing approach. Specific activities were to include:

- Evaluate the marketing approach in terms of level of awareness and attitudes, and whether practices related to the technology and its adoption changed as a result of the marketing effort.
- Explore changes in awareness, sales, and other market-related characteristics.

- Determine if and how well the project is using existing delivery channels and identify what future opportunities exist to use the same or other channels to sell the coupling.
- Indicate whether the MagnaDrive market share is increasing, if the market share will be likely to continue to increase, and whether the coupling is on track to achieve the market share potential as defined in the market characterization update.

Our subsequent discussions with Alliance and MagnaDrive staff indicated that since the company’s marketing plan is being developed in parallel with this evaluation, the **quantec** team could better serve the Phase 2 effort by assisting MagnaDrive in the development of its marketing strategy. The revised Task 4 is as follows:

- Attend the Water Environment Federation’s 73rd Annual Conference & Exposition on Water Quality and Wastewater Treatment (WEFTEC) with the MagnaDrive team. The goal here is to gain insights into the dynamics of equipment purchasing in the wastewater industry from the perspectives of various market actors: equipment manufacturers and their representatives, dealers, distributors, engineering firms, and customers.
- Facilitate a WEFTEC debriefing session with the MagnaDrive executive team in Seattle following the conference. The primary focus is to relate market and sales distribution lessons learned from the water and wastewater treatment segment’s most important trade show, and extend the discussion to other priority market segments, including pulp and paper.
- Review MagnaDrive’s collateral marketing materials from within the context of the response by various market actors and participants at WEFTEC.

The results from this task are provided in Section V of this MPER.

Task 5: Review and Analysis of MagnaDrive Energy and Non-Energy Benefits

As noted in the Phase 1 study “Product Testing: Magna Drive, Report No.1,” prepared by the Motor Systems Resource Facility (MSRF) at Oregon State University, “the MagnaDrive Coupling achieves an average of 62% of the VFD energy savings for fans, and 65% of the VFD savings for pumps.” (p. 9) Since the coupling and competitive VFDs have similar pricing structures, the

MagnaDrive is, on the surface, competitive only in sub-markets where speed control is not currently being used.

Non-energy benefits, however, may make the coupling economically viable relative to ASDs in certain cases. Non-energy benefits already identified by the Alliance and the MSRF include:

- Reduced vibration due to the motor not having a physical connection with the load.
- Less total harmonic distortion (THD) from the MagnaDrive coupling relative to VFDs and THD levels that are very similar to directly connected motors.
- Extreme soft start as the drive allows the motor to start completely unloaded.
- Lower risk of motor and shaft damage in certain retrofit applications relative to VFDs.
- Lower risk of product obsolescence relative to a rapidly changing VFD component market. MagnaDrive guarantees parts availability for 20 years (compared to two years or less for most VFDs), and there are fewer parts relative to VFDs.
- Easier installation due to greater leeway in the shaft alignment and the distance between a typical VFD located at the motor control center and the motor itself. There is a limit to the distance between the VFD and motor. The MagnaDrive is installed on the motor, and thus can be installed in remote locations. This may have benefits in agricultural applications, as well as water and wastewater treatment plants.
- Heat dissipation. VFD technologies have improved, but still need to dissipate heat, which can limit where they can be installed.

The goal of this task is to understand how these and other non-energy benefits may expand and change the speed control market. Impacts of these benefits may be felt in current speed control applications such as increases in mean time between failures, longer motor and ASD lives, lower maintenance costs, and downsizing of motors. They may also help expand the use of speed controls in niche markets where VFDs are not currently used, such as marginal variable loads, non-traditional variable loads (e.g., where loads shift week-to-week or year-to-year), and areas where power quality is sub-standard. A related goal is to identify and quantify, in dollar terms, the economic value of both energy and non-energy benefits.

The **quantec** team will build an Excel spreadsheet-based tool that provides both life cycle cost and simple payback information and is capable of comparing VFD, MagnaDrive, and other ASD technologies. Model inputs would include technology costs and energy savings, but also expected equipment life, maintenance costs, avoided costs (such as repair costs for motor bearings and rewinding of rotors), and salvage value. We will also attempt to quantify the value of equipment reliability, motor downsizing, and other non-energy benefits, and will at a minimum assess these qualitatively.

The major research for this task and a prototype of the spreadsheet model are the next major deliverables of this research effort, and the results from Task 5 will be provided in the second MPER.

Review Alliance's Cost-Effectiveness Assumptions

Another objective of this task is to review the Alliance's cost-effectiveness analysis for the MagnaDrive. We will review and comment on these assumptions in the second and third MPERs. The Alliance's main cost-effectiveness assumptions are listed below.

1. The MagnaDrive Coupling is creating new market niches because it is applicable to motors that do not lend themselves to VFDs. These include motors in the following type of applications:
 - medium voltage / large horsepower motors where VFDs are more expensive,
 - motors with seasonal variability,
 - rough and dirty duty cycles,
 - vibration restrictions,
 - poor power quality areas,
 - retrofit applications that are not suitable for VFDs,
 - and where motor down-sizing is possible.
2. The Alliance segmented the existing motor national motor fleet by industry and application. The Alliance selected industries and applications where the coupling was deemed to be competitive. The criteria included larger HP applications and those with variable loads such as processes involving pumps, fans, and blowers. The end result was that of the 1.7 million motors nationally that are more than 50 HP, less than 10% were viewed as having loads where the MagnaDrive Coupling would be considered for installation, and only 3.5% are located in the PNW. One reason for this reduction was that only 34% are estimated to have loads

that vary enough or are on long enough to warrant the installation of any type of ASD and that VFDs were assumed to serve 37.5% of this load in 1999 while MagnaDrive serves 0.2% (1,100 HP).

3. Variable loads that had VFD installations were assumed to be growing at 5% per year. However, MagnaDrive is assumed to expand the speed control market to other applications causing the speed control market to increase by another 2% a year. MagnaDrive is assumed to capture 23% of the total speed control market by 2010. Coupling costs are assumed to go down to achieve this market penetration, but no numbers are specified.
4. Average energy savings were assumed to be 18%. This conservative estimate was based on savings as compared to using a throttle or damper and weighted by application type, variability of load, hours of operation, and MagnaDrive Coupling penetration within an application. No non-electric benefits or net O&M costs were assumed. While reduced vibration may increase motor life, and in some applications motors can be downsized due to soft starting, these effects were not included in the analysis.

III. Customer and Non-Customer Interviews

Overview

To assess current practices, attitudes, and awareness of the MagnaDrive and the speed drive market, the **quantec** team conducted interviews with a number of customer purchasers and non-purchasers:

- Four participants at demonstration sites
- Six customers that purchased the coupling without Alliance co-funding
- Four non-purchasers who were familiar with the MagnaDrive
- Seven non-purchasers who were not familiar with the MagnaDrive

We also conducted interviews with the two primary trade associations for the WWT and P&P industries, Northwest Biosolids Management Association (NBMA), and the Technical Association of the Pulp and Paper Industry (TAPPI). We also conducted an interview with a consulting firm for the water and wastewater industry, HDR Engineering.

As shown in Table III-1, the majority of the interviews were conducted with P&P and WWT end users, customers in the two industries that were thought to have the greatest potential for MagnaDrive sales. Several customer interviews from Groups 1 and 2 were performed in person to allow the **quantec** team to gain additional insights into the installation, operation, and performance of the MagnaDrive. Professional engineers from our team conducted the remaining interviews via telephone.

**Table III-1
Number of End Users Interviewed**

Group	Number Available	Number of Interviews Completed	Business Sector for Completions		
			P&P	WWT	Other
1. Customers at demonstration sites	5*	4	2	1	1 large commercial building
2. Customers with no Alliance funding	7*	6		4	1 irrigation, 1 electric power plant
3. Non-purchasers familiar with MagnaDrive	12 (5)*	3	0	3	
4. Non-purchasers not familiar with MagnaDrive	875**	9	5	4	

* MagnaDrive provided customer contacts. Of the non-purchasers, 4 were WWT and there was one P&P company.

** The Alliance and the quantec team developed a database of approximately 875 potential customers in the Wastewater (825) and Pulp & Paper segments (50)

Interview Design

The interviews were designed to elicit the following general information across these groups:

- **Market sector information** (e.g., water/wastewater treatment, pulp and paper). Do different sectors have different perceptions of adjustable speed drives? This information will help characterize the potential adoption and diffusion of the coupling across market segments.
- **Project information** (e.g., motor application such as process, pumping, conveyance, etc.). Motor size, voltage requirements, variability of load, and other specific considerations, such as location (local or remote), room conditions, distance from motor control center, etc.
- **Cost information.** What kind of costing analyses are performed – simple payback or life-cycle costs? What costs are considered in the financial analysis – only energy costs? Non-energy costs/benefits? Was cost the primary motivator? What other motivators were there?
- **Information about the purchase/not purchase decision.** To what extent did the market barriers identified in Phase 1 – lack of in-field performance data, lack of knowledge, and lack of brand recognition in the marketplace – affect the purchase decision? Was the purchase decision driven by non-energy considerations such as location,

impact on power quality, harmonics, reducing cooling requirements, or noise?

- **Comparison with Variable Frequency Drives (VFD).** Does the system use high voltage (VFDs expensive) or low voltage (VFDs less costly)? What is the distance to motor control center (VFDs have distance limits)? What are the environmental conditions (VFDs need to dissipate heat)?

The interview instruments varied across the groups so that they could answer the following questions for each group.

Purchasers

- **Why did end users purchase the coupling?** Was the coupling purchased to resolve a specific motor system problem, as part of a facility upgrade, or part of a facility expansion? Did the coupling have features that were needed for a specific application? What coupling features were the most compelling? Why didn't they purchase a VFD? How influential was Alliance funding (Group 1), MagnaDrive marketing, and other market actors in the decision-making process? What role did economics (both energy and non-energy benefits/costs) play?
- **What is their past and current level of use of speed control in motor systems?** Is this expected to change and, if so, how?
- **How satisfied are they with the coupling?** Is it working as expected? Have there been any unexpected advantages or disadvantages to using the coupling? Has the coupling required much maintenance?
- **How satisfied was the customer with the ordering and installation process?** What could be improved? Were there any unexpected or hidden costs?

Non-Purchasers

- **Why did they not purchase or were not interested in purchasing the coupling** (e.g., no applications, too expensive, risk aversion)? What product information would be required for them to become interested (e.g. appropriate applications, more information, longer product track record)? What economic information would be helpful (life cycle cost comparisons, simple paybacks, energy saving benefits, non-energy benefits)?

- For those unfamiliar with the coupling would they be interested? Why or why not?
- What is their past and current level of use of speed control in motor systems? Is this expected to change and, if so, how?

The interview instruments are contained in Appendix A. Nearly all of the questions are open-ended, so the type of information provided by each respondent varies. All of the responses are included in the Microsoft Access database that accompanies this MPER. The remainder of this section summarizes the essential insights from these interviews by industry type.

Findings from Water & Wastewater Treatment Industry

We completed a total of 12 WWT interviews, five with purchasers of the MagnaDrive, and seven with non-purchasers. Of these purchasers, one received Alliance funding (Group 1), four purchased the drive without co-funding (Group2), and a total of four were conducted on site. Three of the non-purchasers were familiar with the MagnaDrive (Group 3) and four were not familiar with it (Group 4).

General Market Sector Information

The water and wastewater industry is considered to be conservative in installation of new technologies. However, the sector generally has good perception of adjustable speed drives and is interested in new speed control technology as indicated by the much higher VFD penetration in the newer plants and the plants that had recent upgrades and renovations.

We interviewed HDR Engineering, an industry leader in water and wastewater treatment, who estimated the average VFD penetration to be 10%. This is in close agreement with the 12% recently estimated by the Alliance.³ Given the low VFD penetration and the fact that most respondents expect the penetration of speed control devices to increase in the future, there is significant potential for the application of the MagnaDrive in the WWT market segment (these estimates are contained in Section IV). However, the market potential for MagnaDrive will be:

- Where motors have variable loading and mechanical problems such as vibration

³ *Energy Efficiency within the Pulp & Paper, Waste & Wastewater, and Irrigation Markets in the Pacific Northwest*, Ducker Worldwide, Alliance Report #00-067, November, 2000.

- Where a VFD would be a good solution to process control but would generate intolerable harmonics in the electrical system or intolerable vibration in the mechanical system
- Where MagnaDrive has a price advantage over VFDs (large motors and medium voltage motors)
- In retrofit applications where the customer has older, sound working motors but is nervous about using VFDs that might lead to premature “burn out” and motor replacement.

The typical flow of the WWT plants surveyed range from 3 MGD to 120 MGD. The population served by these facilities ranges from about 50,000 to 500,000. Population, however, is not always a good predictor of WWT size. Residential wastewater contributes about 70% to 80% of the plant flow in most cases. However, two of the plants interviewed have commercial/ industrial uses that contribute nearly three-quarters of the plant flow.

The motor sizes of the plants surveyed range from fractional to up to 1000 HP. About 80% of the motors were 50 HP or less, about 16% were between 50 HP and 250 HP, and about 3% were above 250 HP. For wastewater treatment plants, however, most of the large motors (200 HP and up) were for the aeration blowers in the activated sludge process, which accounts for 50% or more of the total energy usage⁴ for wastewater treatment plants. Activated sludge is the most common secondary process for treating wastewater. Water and wastewater treatment plants generally use 460/480Volt systems. Only a few very large motors (e.g., 1,000 HP aeration blowers) use 2,300V or 4,160V systems.

Most plants have no standard O&M procedures but spend much time in preventive maintenance (PM) of the motors and motor-driven equipment. Typical PM tasks include vibration testing, motor testing, and balancing. Virtually all respondents indicated vibration testing as part of their PM program. Some of the common motor problems include bearing failures, vibration, and motor overloading.

WWT maintenance and operation supervisors generally select the equipment to be purchased and submit the purchase request to the director of the plant. Since most water and wastewater treatment plants are public facilities, the City Council or the Board would make the final purchase decision.

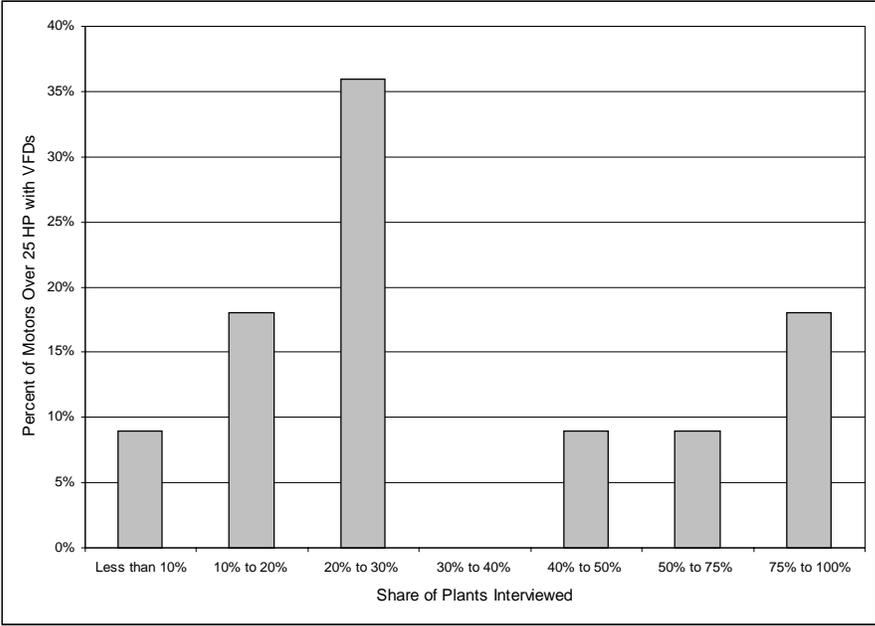
⁴ EPRI Report, “Energy Audit Manual for Water/Wastewater Facilities,” Figure 3-4.

The respondents indicated that payback and life cycle cost analyses were performed for purchasing and installation of motors and motor drives. Some respondents indicated that the first costs were also important in decision-making. Energy efficiency is also an important purchasing criterion, but is often outweighed by process-related issues such as load balancing and vibration.

Most of the respondents could not accurately estimate the variability of loads. However, VFDs have significant penetration for the plants surveyed; 11 of the 12 plants interviewed provided information related to VFD penetration. The average VFD penetration of 40% is much higher than the industry average of 12%⁵ in the Pacific Northwest.

Table III-1 shows the distribution of VFD penetration across these plants. It is interesting to note the bi-modal nature of this distribution: nearly two-thirds of the plants have VFD penetration less than 30%, while about one-fourth have VFD penetration exceeding 50%, and most of these have nearly 100% penetration.

Figure III-1
VFD Penetration among WWT Plants Interviewed



⁵ *Energy Efficiency within the Pulp & Paper, Waste & Wastewater, and Irrigation Markets in the Pacific Northwest*, Ducker Worldwide, Alliance Report #00-067, November, 2000.

Some plants had major plant upgrades and/or expansion during the recent years. During the upgrades, VFDs were installed for process controls. For example, McMinnville Sewage Treatment Plant (STP) is a five-year-old plant and has 30% VFD penetration. St. Louis Metro STP went through a major upgrade in 1993, and the plant now has 65% VFD penetration. These “newer” plants have much higher VFD penetration than the industry average of 12%, indicating substantial room for speed control opportunities in older plants.

MagnaDrive Purchasers

Most users who purchased the coupling did so to improve production processes and reduce overhead and maintenance (O&M) expenditures and downtime. The WWT plants typically had many motors covering a large range of sizes, and speed control capability was desirable for most. Generally, speed control was important because of the need to handle varying water flows.

One water treatment user purchased the coupling to reduce intake water spillage: “we needed to decrease waste by better matching production with demand.” This customer purchased the MagnaDrive to test it out on their system.

Another WWT purchaser wanted to save energy on the blowers that provide oxygen to the plant’s digesters. He also thought it would provide non-energy benefits through vibration reductions and mitigation of shaft alignment problems, which should increase the pump life.

Another respondent echoed this theme. Once he saw the MagnaDrive coupling operate, he was convinced that it could solve the cavitation problems that were leading to major, regular failures of their pump supports, bearings, seals, etc. He was looking for a major reduction in O&M and also wanted energy savings.

The simplicity and apparent low maintenance requirements of the MagnaDrive are other inherent characteristics important in applications where there may be a small or inexperienced maintenance staff.

Most of the MagnaDrive purchasers had experience with VFDs and reported various problems with them. One said, “you pay twice for a VFD – once when you buy it and again when you operate it.” Thus, the respondents were extremely interested in the potential of the MagnaDrive.

Energy efficiency was considered a nice benefit but often was not the driving factor in making the installation decision. In fact, energy savings were often

only important from the perspective of calculating the lifecycle costs or payback period of the equipment, which also includes changes to O&M costs, production efficiencies, etc. According to one respondent, “energy efficiency is getting more and more important, but nobody jumped up and down when they were talking about the MagnaDrive and any comparisons between its efficiency and the efficiency of a VFD.”

One WWT firm purchased the MagnaDrive because of the repeated failure of a VFD. “We had a VFD that we could not fix. After trying to fix it many times, we saw the MagnaDrive and believed it would solve our problems.”

Interestingly, while paybacks or some form of financial analysis is required for purchasing, VFDs were not really being compared to the MagnaDrive in these WWT applications. In one instance, the chief engineer did have to provide a VFD financial comparison, but it was no contest because VFD installation costs would have been far higher and more complex. They would have had to construct an additional room because of space constraints in current pumping room, plus it would have needed to be protected from water.

Customer Satisfaction with the MagnaDrive and the Purchase/Installation Process

Most of the purchasers’ reactions to the technology were very positive. All respondents gave the technical concept of the MagnaDrive high marks and reported that the unit appeared to be professionally designed and manufactured.

There were mixed reviews, however, on the performance. Most end users felt that the units delivered on their promises, but there were some surprising performance shortfalls. Noise and heat were mentioned by a few end users. *Increased* energy consumption was a complaint of one user, but we believe it is likely that this finding is really the result of a flawed measurement approach. The reactions to the installation process were also mixed. Customers were generally positive about the installation experience when the assembly line or process could be shut down for several hours with no problem, but they were unhappy when a relatively long shut down was not feasible or was very expensive (as happened in a few of the installations). According to one respondent, “[MagnaDrive] will have to develop it as a drop-in unit if they want to make more sales.”

One customer said that MagnaDrive is still struggling with customer management as the company grows. He complained that they had just now received their instruction manual (four months after installation) and it has “holes” in it (e.g., it says to lubricate the MagnaDrive, but it doesn’t say if it

should be done once a month or once a year.) “The technology is great, but their relationship with customers needs to be improved.”

The most important litmus test, however, was customer interest in installing another drive, and more than half of the respondents (five) said they had already purchased another MagnaDrive, while three others said they were likely purchase another MagnaDrive. However they are not buying several at a time. Repeat purchases typically involve buying one or two Couplings for specific applications in the next capital budgeting cycle. These applications tend to be specific motors with issues such as shaft alignment, vibration, or a need for speed control from a WWT process standpoint. Broader saturation within these facilities will likely require lower Coupling prices and creative financial solutions to allow WWT agencies to overcome capital budget constraints and the long lead times associated with project approvals.

Non-Purchasers

An interesting, although not statistically reliable, difference between purchasers and other WWT firms is that all non-purchasers expressed satisfaction with current VFD operation in their plants and expect increases in the installations of VFDs. With such a small sample size, we cannot say whether or not the problems with VFDs noted by purchasers are systemic within the industry.

Of the three WWT Group 3 contacts, only one had seen the MagnaDrive demonstration and originally had expressed an intention to install one. The other two learned about MagnaDrive through the website or from maintenance personnel of the plant. The basic reason for non-purchases at these two sites is a lack of information; they would like additional information before they consider MagnaDrive. Additional information includes product and installation costs, efficiency (and comparison to VFD), and product support through vendor or supplier.

MagnaDrive will need to focus more on educating engineering firms about their products, especially the consulting firms to the wastewater industry. The potential customer who originally wanted to purchase the drive said he wanted to use it to retrofit a six-75 HP motor system; however he didn't purchase MagnaDrive because it wasn't recommended by an engineering firm. Apparently, the engineering firm was suspicious about the new product and saw it as a risk. Three of the four WWT contacts surveyed in Group 4 expressed interest in new speed control technologies, including the MagnaDrive. They wanted to see additional information, including product information, efficiency comparison to VFD, reliability, prices, and

testimonials. For example, one customer said he “saw potential for a MagnaDrive application for oxidation ditch mixers and may consider MagnaDrive in their expected upgrade.” However, he would first need information on price, efficiency, and reliability.

Findings from the Pulp & Paper Industry

We completed a total of seven P&P interviews – two purchasers of the MagnaDrive who received funding (Group 1) and five non-purchasers who were not familiar with the coupling. One of the purchaser interviews was conducted on site.

General Market Sector Information

The Technical Association of the Pulp and Paper Industry (TAPPI) provided contact information for an individual they identified as an industry expert. He has worked for many years as a maintenance supervisor in various pulp and paper mills and now writes articles for several publications, including the *TAPPI Journal*.

He indicated that the pulp and paper industry is very conservative. Reliability is typically a more important equipment/process improvement criterion than cost. Any new product will be initially viewed as a potential liability until its reliability can be verified and its benefits clearly identified. He noted typical preventive maintenance programs as fairly elaborate, including cleaning, performance tests, infrared (IR) observations, and vibration tests.

The P&P industry expert indicated that, for MagnaDrive to penetrate that market segment, the company would have to show a clear need for the product by quantifying its financial benefits in terms of the return on investment, energy benefits, and a reduction in downtime. He also believes that case studies and testimonials in trade journals are the best way to reach the decision-makers in this industry and expressed interest in doing an article about MagnaDrive in an upcoming *TAPPI Journal* edition.

A related issue is mean time between failure (MTBF) for each Coupling. While the twenty-year parts guarantee offered by MagnaDrive is exceptional in the speed control market, the Company still needs to document MTBF in those applications where the Coupling has been used for a long time. Of course this is exceedingly difficult presently, but documentation of MTBF will become increasingly important as MagnaDrive moves beyond early adopters into the broader customer market. Additionally, MagnaForce may be able to

provide documentation for its fixed coupling and tests of the MagnaDrive coupling.

The survey successfully captured information from a range of P&P plants, both in terms of daily output and type of product manufactured. The production levels of the five P&P plants we surveyed range from 420 to 1,500 tons per day. The products manufactured at the plants include standard paper, liner board, corrugated board, fine paper, copy paper, newsprint, tissue paper, and milk cartons. Throughout those sites included in the survey, there was general agreement regarding the perception of adjustable speed drives. VFDs have, to varying degrees, penetrated all of the pulp and paper mills, and the staffs are fairly satisfied with the results. There is also agreement among all respondents that the penetration of variable speed control could increase substantially, given reliable equipment and lower prices.

The P&P plants surveyed contain between approximately 700 and 5,000 motors. None of the respondents could provide a definitive number of motors at their plant; due to the large numbers of motors, they had to estimate the totals. About half of the motors identified are less than 50 HP, although several motors in the range of 4,000 HP to 5,000 HP, and one as large as 12,000 HP, are located at the surveyed plants.

Most plants have semi-formal O&M procedures in place. These firms are very concerned about keeping their motor systems up and running. Downtime is very costly; it can easily exceed \$5,000 per hour. O&M is typically done in-house, and costs are generally not tracked or are only partially tracked.

The respondents indicated that several types of cost analyses were performed, and these were not necessarily consistent from facility to facility. For most, a fairly simple analysis, such as simple payback, is performed for smaller motor systems. Surprisingly, most of the respondents indicated that energy efficiency is included in the decision-making criteria. One respondent even mentioned that only energy-efficient equipment is considered for purchase. For larger motor systems, a more complex analysis is usually performed, such as life-cycle costs. Here again, most include energy efficiency in the analysis. While most of the plants have a motor repair/replacement plan, most do not consider early replacement of their motors. Similarly, while most of the respondents indicated that mean time between failure is an important value for motors and couplings, respondents did not track this value. The same decision-makers are responsible for purchasing both motors and drives at the plants surveyed. These decision-makers, in general, consisted of plant supervisors and engineers. One respondent, however, mentioned that the CEO made the final purchase decision for large motors.

VFDs are installed in between 6% and 40% of the motors in the plants. In general, the VFDs are installed to provide process control for variable load applications. Most of the VFDs are installed on smaller motors because of the high costs of larger VFDs. Most respondents indicated no major problems with their motor systems or VFDs. All of the surveyed plants indicate that they expect VFD penetration to increase as costs continue to decrease.

Most respondents seemed interested in obtaining variable speed control for more of their process motors. The fact that reliability is so important for them – much more important than energy efficiency – and with low overall VFD penetration, there is significant potential for MagnaDrive applications. MagnaDrive must leverage their reliability advantage to gain greater market penetration in the pulp and paper industry.

MagnaDrive Purchasers

As there were only two P&P purchasers in our sample, it is difficult to generalize. One firm bought a MagnaDrive Coupling because a distributor first told them about it, and then they saw the demonstration. In this application, the MagnaDrive was installed on a recirculation pump that runs continuously to make sure that it can dump liquid from a tank immediately if necessary. Without any control, the pump runs at almost full speed most of the time, and this wastes energy. The MagnaDrive allows them to run the pump at slow speeds and use less energy when it is just recirculating liquid. They were not looking for anything other than speed control and energy savings, and the Alliance co-funding made the installation financially attractive.

The other user had a hydraulic speed control on their effluent pumps, but there was a lot of vibration, requiring that they repair and rebuild their drive shafts and pumps frequently. There were problems trying to maintain alignment. Also, with throttles to reduce the flow, the pumps experience cavitation because they run at full speed even when the flow is throttled down, which causes vibration. He estimated they had to do four rebuilds per year on three pumps/shafts (they use one pump at full output most of the time and vary the second to follow the load and keep the third as a backup). Each rebuild costs about \$10,000, so they were spending \$40,000 per year. They believed the MagnaDrive would reduce the vibration and related costs. They paid about \$32,000 for two MagnaDrive units. The main economic driver was the cost of rebuilding motors and replacing damaged shafts, which they are hoping to avoid. They recognize the energy savings benefits and that these savings will continue into the future.

This manager was personally aware of MagnaForce, as his company and MagnaForce are located near one another. A salesman from MagnaDrive was the first to describe the technology to them. Alliance funding was important, but the fact that the Alliance was supporting the technology was even more important because it increased their confidence. He stated that the P&P industry is reluctant to try something new and that they don't have the time to assess every new technology. They figured that the Alliance had a "bunch of smart guys" and if they were supporting the technology, then it saved his company doing the research. They felt that promotion by the Alliance of the environmental benefits of the technology would be a plus based on what MagnaDrive told them.

Economics was also very important in this instance. They took into account first cost, energy savings, and O&M. The MagnaDrive won out because the first cost was less than a VFD.

Customer Satisfaction with the MagnaDrive and the Purchase/Installation Process

The second P&P customer was quite satisfied with the installation process; their only complaint was that it would have helped if they knew in advance what skills would be needed to do the installation. They did know that they needed instrumentation and control, but their electrician was on vacation, and this was a problem. He did say that the learning process was very straightforward and that "the next one should go just fine." They are also very satisfied with performance to date. They recently measured the vibration and it is, as expected, extremely low.

The installation process at the first P&P plant was not as smooth. We note that this was the very first commercial installation of the MagnaDrive coupling and that installation performance as reported by other customers has improved markedly over time. Despite the fact that the customer had not fully prepared for the installation and this was a learning experience for MagnaDrive, the installation was completed well within what was a normal shutdown of the plant.

Non-Purchasers

We interviewed five P&P companies who were not familiar with the MagnaDrive. However, they were all are very familiar with motors and drives, and most of the people we talked to are decision-makers for equipment purchasing.

Their two main decision criteria confirm what the TAPPI expert said: it all comes down to reliability and cost. Pulp and paper manufacturers want reliable variable speed control and are willing to pay for it – up to a point.

Generally, the people interviewed are satisfied with their existing VFDs. However, the low penetration level – especially for high horsepower equipment – provides ample opportunity for MagnaDrive to enter the marketplace if they can produce a relatively inexpensive product. If MagnaDrive is successful in bringing to market their product in the large horsepower range where VFDs are expensive, they should be able to penetrate the market.

Summary of Customer Interview Findings

There were several lessons learned from the interviews about how the MagnaDrive unit can be marketed best. Potential end users are influenced by direct results – seeing the unit, word-of-mouth, etc. One interesting marketing strategy might be to sell maintenance staff on installing a small MagnaDrive that would not have to go through the capital budgeting process. Once a small unit is in place, it would be easier to convince management of the advantages and get them to budget for larger ones.

The respondents also reported that MagnaDrive should continue to seek additional marketing opportunities through trade associations (such as TAPPI), trade publications (*Pumps and Pumping*, *Pulp and Paper*, *TAPPI Journal*, *Water Digest*, and *Lockwood Post*) and trade shows.

The WWT industry interviews suggested that non-energy benefits often outweigh first costs and energy savings in customer decisions. There are situations where the inherent characteristics of the MagnaDrive give it an advantage over VFDs, even when first costs are higher and energy savings are immaterial. These include situations where motors have variable loading and mechanical problems such as vibration, and where a VFD would be a good solution to process control but would generate intolerable harmonics in the electrical system or intolerable vibration in the mechanical system.

One of the non-energy benefits noted by the Alliance in its Phase 1 MagnaDrive research was noise reduction. However, disparate customer experiences suggests this particular benefit may be site and motor specific. In many cases the noise is considerably less than with a VFD, but in others the noise seems to be higher than with a VFD or without any speed control. We recommend that additional research be conducted regarding the noise issue, perhaps as part of a broader effort that also considers heat issues, to determine

under what circumstances noise will decrease (increase) with a MagnaDrive Coupling installation.

Our interviews with P&P firms indicated that MagnaDrive will need to work through normal equipment distribution channels to gain a significant foothold in this industry. The P&P industry is more conservative than the WWT industry. Nobody wants to be the first to try out a new technology. Most of the people we interviewed read trade journals, and some mentioned that case studies would be an effective way to reach decision-makers. One interviewee cautioned, however, that a case study would have to be “pretty dramatic” to really motivate a decision-maker to try an unknown product. Others suggested that information such as return-on-investment and reliability improvements – especially a reduction in downtime – would be important information to include case studies.

Another important finding for the P&P industry is the importance of economics in customer decision-making. Most respondents look at paybacks or life cycle costs, and value of energy savings as an important selection factor.

IV. Market Potential Update

Background – Phase 1 Market Characterization

A recent Alliance motors and adjustable speed drive (ASD) market study (Study),⁶ which was part of Phase 1, provided estimates on the number of motors in the United States, and the size of the ASD market. The table below, which is reprinted from that report, shows the estimates of motors by industry and size.

**Table IV-1
US Integral Motors in Place by Size and User Group (000s)**

Market Segments/ Industry	Total Number of Integral Motors	Population of Motors by HP Range					Total over 50 HP
		Under 50	50 to 100	100 to 200	200 to 500	Over 500	
Light & Medium	7,157	6,981	96	58	15	7	176
Process	4,299	3,842	232	128	65	32	457
Other Heavy	1,724	1,364	206	84	118	32	440
Water/Wastewater	170	129	19	25	30	14	88
Commercial HVAC	35,236	34,800	260	80	92	4	436
Agriculture	132	52	61	13	10	0.5	85
Total	48,718	47,168	874	388	330	90	1,682

The Study also focused on the potential market for variable load applications. It concluded that the ASD market in the US is approximately \$1.6 billion and growing at a high rate of about 20% per year in terms of units. Dollar growth is somewhat lower since ASD prices are on a downward trend.

The Study also contains estimates of how many of those variable load applications are suitable for MagnaDrive under the three scenarios (most optimistic, middle ground, and least optimistic). Motors under 50 HP were excluded from the analysis because the costs of the MagnaDrive were higher at that time than ASDs. The findings suggested that MagnaDrive had the potential to reach an annual market ranging from \$20 to \$80 million across

⁶ “Variable Frequency Drives.” prepared for the Alliance by Easton Consultants, Report #00-054, June 2000.

these scenarios by 2004, which would represent 5% to 20% of the U. S. adjustable speed drive market above 200 HP.

The **quantec** team reviewed the Study as part of this Market Potential Update, and we believe it provided a very good “top-down” breakdown of the motor market by size, sector, and application. It also provided a good overview of the motor systems industry structure including ASD competitors, distribution, the role of engineering firms, and end users. It was also useful in providing a first cut in determining which sector(s) MagnaDrive should focus on.

Our discussions with the MagnaDrive Corporation indicated that, while the Company found value in much of the information, they were looking for a different focus in this update:

- Another top-down market characterization would not provide the Northwest-specific “market intelligence” desired by the MagnaDrive team.
- The Study’s focus on medium (200 HP to 500 HP) and large (over 500 HP) applications. The study found little potential in the under-200 HP range and none in the under-50 HP range. In our discussions with Easton Consulting, it was apparent that these segments received limited attention because the MagnaDrive was not “price competitive.” But MagnaDrive does have some price flexibility (prices have been reduced for smaller drives since the Easton report was published), and costs will come down if the company can start producing more similar sized units.

Market Potential Update Approach

Given our review of the Study and our discussions with MagnaDrive staff, the Alliance and the **quantec** team revised the focus of the market characterization task so that it would also provide useful market information to the MagnaDrive Corporation. Our revised approach involved developing a partial “bottom-up” characterization for the wastewater treatment, and pulp and paper segments, that produced Pacific Northwest-specific potential estimates across motor size ranges. We call this a partial bottom-up approach as it is based on firm specific data in these industries, the results of the interviews in Section III, and a mixture of bottom-up and top-down analyses from the following studies:

- “Energy Efficiency within the Pulp & Paper, Waste & Wastewater, and Irrigation Markets in the Pacific Northwest (Ducker Report)”⁷
- “Opportunities for Industrial Motor Systems in the Pacific Northwest (Pacific Northwest Opportunities Report)”⁸
- “United States Industrial Electric Motor Systems Market Opportunities Assessment” (Opportunities Assessment)⁹
- A recently developed database of Pacific Northwest wastewater treatment facilities developed by the Alliance and **quantec**.
- A Pacific Northwest P&P database developed by the Alliance and the **quantec** team

WWT Market Potential Estimates

The Alliance and **quantec** developed a WWT database with a total of 825 Pacific Northwest plants. Of these plants, the largest twenty facilities are responsible for more than 40% of the energy consumption. Of these large plants, one-half are energy intensive activated sludge facilities which account for 25% of the total energy used by the Pacific Northwest WWT industry.

Table IV-2 summarizes the motor-related information for the Northwest WWT industry. The information is comprised primarily from the Ducker Report and the Opportunities Assessment.

**Table IV-2
Water and Wastewater Treatment Motors in the Pacific Northwest**

	Pumps	Fans	Total
WWT motors	15,300	9,100	24,400
< 50 HP share	60.0%	55%	
51 HP – 300 HP share	33.5%	30%	
> 300 HP share	7.5%	15%	
< 50 HP motors	9,180	5,005	14,185
51 HP – 300 HP motors	5,126	2,730	7,856
> 300 HP motors	995	1,365	2,360

⁷ Prepared for the Alliance by Ducker Worldwide, November, 2000.

⁸ Prepared for the Alliance by Easton Consulting and XENERGY, Report # 99-044, December 1999.

⁹ Prepared for the DOE Office of Industrial Technologies by XENERGY, 1998.

As noted in the Phase 1 Study, most industrial plants use low voltage for drives up to 500 HP, but medium voltage motors represent approximately 15% of the total for motors between 300 and 500 HP. Note that most motors above 300 HP will be medium voltage, where MagnaDrive should have a cost advantage over VFDs.

A range of MagnaDrive Coupling market potential estimates for the Pacific Northwest WWT industry is contained in Table IV-3. Average ASD penetration currently in the market is calibrated to the 12% in the Ducker Report, with the distribution across motor sizes based on information collected in the WWT customer interviews.

**Table IV-3
MagnaDrive Potential in Pacific Northwest Water and
Wastewater Treatment Plants**

	<50HP	51-300HP	>300HP	Total
Number of Motors	14,185	7,856	2,360	24,400
Existing ASD Penetration	2.5%	20.0%	40.0%	11.8%
Existing ASDs	355	1,571	944	2,870
High Potential Case				
Total ASD penetration	33%	75%	90%	51%
Total ASDs	4,681	5,892	2,124	
New ASDs beyond those in the equipment stock	4,326	4,321	1,180	
MD coupling share	50%	50%	50%	
MD couplings	2163	2160	590	4,913
Low Potential Case				
Total ASD penetration	10%	50%	67%	27%
Total ASDs	1,419	3,928	1,581	
New ASDs beyond those in the equipment stock	1,064	2,357	637	
MD coupling share	10%	10%	10%	
MD couplings	106	236	64	406

The high potential case combines several optimistic assumptions that are certainly attainable in today's environment:

- The cumulative ASD penetration (including new and retrofit motors) in the WWT market reaches 50% in the next several years with high energy prices, and broad industry recognition that variable speed technologies can improve production processes and save energy.

- MagnaDrive's aggressive marketing, broader distribution, and continued technological improvements lead to across-the-board ASD price reductions.
- MagnaDrive obtains a 50% market share due to a combination of price and non-price product features particularly useful to the WWT industry.

The low potential case combines several pessimistic assumptions that are also possible in today's environment:

- The cumulative ASD penetration in the WWT market increases, but only reaches 25% in the next several years.
- Anticipated cost and price reductions for the MagnaDrive do not materialize, particularly in the smaller motor sizes.
- MagnaDrive obtains a 10% market share.

Using current prices for the low scenario and somewhat lower prices for the high scenario, and assuming that the potential is reached over a five-year period, MagnaDrive's annual WWT sales would range from approximately \$1 million to \$8 million. We note that WWT range estimate only considers Pacific Northwest facilities; sales will, of course, be far higher as MagnaDrive expands distribution and sales throughout the U.S. and Canada, as well as internationally. As the population of the Northwest represents about 4% of the national total, this suggests that MagnaDrive's domestic WWT annual market potential ranges from \$25 million to \$200 million.

The Alliance estimates that average energy savings associated with each Coupling installation is 8%. This conservative estimate is based on savings as compared to using a throttle or damper and weighted by application type, variability of load, and hours of operation. The Alliance also estimates that the base WWT motor energy usage ranges from 2,000 to 3,000 gWh annually. Combining these usage and savings figure with the cumulative MagnaDrive market penetration estimates in Table IV-3 yields savings ranging from 9 to 130 gWh annually in Pacific Northwest WWT facilities.

P&P Market Potential Estimates

There are 40 P&P plants and 10 headquarters facilities in the Northwest. The plants represent approximately 10% of the total national total number of plants. However, the Pacific Northwest facilities tend to be larger, on average, and represent between 10 of the national energy consumption used by the

industry. Eleven of these plants represent nine manufacturers, and account for nearly 75% of production.¹⁰

The range of motors in Northwest is very uncertain. The Ducker Report indicates that there are over 170,000 motors running pumps and fans, while the Pacific Northwest Opportunities Report indicates that the total is 15,000. Our interviews and subsequent analyses of plant capacities in the database indicates that the total number of motors in the Pacific Northwest is 58,000. As this estimate is within this very broad range and is based on our bottom-up analyses, we use the 58,000 figure in the analyses that follow.

Table IV-4 summarizes the motor-related information for the Pacific Northwest P&P industry. Overall pump and fan shares represent an average of the shares from the Ducker Report and the Opportunities Assessment. Similarly, the HP shares represent an average of the estimates from these reports.

**Table IV-4
Pulp and Paper Motors in the Pacific Northwest**

	Pumps	Fans	Total
P&P motors	26,180	31,320	58,000
< 50 HP share	76%	65%	
51 HP – 300 HP share	19%	29%	
> 300 HP share	5%	6%	
< 50 HP motors	20,277	20,358	40,635
51 HP – 300 HP motors	5,069	9,083	14,152
> 300 HP motors	1,334	1,879	3,213

Table IV-5 contains a range of market potential estimates for the Pacific Northwest P&P industry. Average ASD penetration currently in the market is calibrated to the 10% estimate in the Ducker Report, with an assumed penetration of 7.5% in the under 50 HP market, 15% in the 50 to 300 HP market, and 20% in the over 300 HP market. Again, medium voltage motors are expected to dominate in the greater than 300 HP category.

¹⁰ *Energy Efficiency within the Pulp & Paper, Waste & Wastewater, and Irrigation Markets in the Pacific Northwest*, Ducker Worldwide, Alliance Report #00-067, November, 2000.

**Table IV-5
MagnaDrive Potential in Northwest Pulp and Paper Plants**

	<50HP	51-300HP	>300HP	Total
Number of Motors	40,635	14,152	3,213	58,000
Existing ASD Penetration	7.5%	15.0%	20.0%	10.0%
Existing ASDs	3,048	2,123	643	5,813
High Potential Case				
Total ASD penetration	50%	70%	90%	53%
Total ASDs	20,317	9,906	2,892	
New ASDs beyond those in the equipment stock	17,270	7,784	2,249	
MD coupling share	50%	50%	50%	
MD couplings	8635	3892	1125	13,651
Low Potential Case				
Total ASD penetration	15%	50%	67%	19%
Total ASDs	6,095	7,076	2,153	
New ASDs beyond those in the equipment stock	3,048	4,953	1,510	
MD coupling share	10%	10%	10%	
MD couplings	305	495	151	951

The high potential case combines several optimistic assumptions that are certainly attainable in today's environment:

- The cumulative ASD penetration in the P&P market exceeds 50% in the next several years with high energy prices, and broad industry recognition that variable speed can improve production processes and save energy.
- MagnaDrive's aggressive marketing, broader distribution, and continued technological improvements lead to across the board ASD price reductions.
- MagnaDrive is able to make significant inroads across key market actors including OEMs, distributors, manufacturer representatives, and engineering firms. An array of positive industry-specific journal articles and case studies spawns this outcome.
- MagnaDrive obtains a 50% market share due to both the marketing effort and its ability to compete effectively on both first costs and life cycle costs (LCC) against ASD competitors.

The low potential case combines several pessimistic assumptions that are also possible in today's environment:

- The cumulative ASD penetration in the P&P market increases, but only reaches 20% in the next several years.
- Anticipated cost and price reductions for the MagnaDrive do not materialize, particularly in the smaller motor sizes.
- MagnaDrive obtains a 10% market share.

Using current prices for the low scenario and somewhat lower prices for the high scenario, and assuming that the potential is reached over a five-year period, MagnaDrive's annual P&P-related sales would range from approximately \$3 million to \$18 million. We note that P&P range estimate only considers Pacific Northwest facilities; sales will, of course, be far higher as MagnaDrive expands distribution and sales throughout the U.S. and Canada, as well as internationally. Since the Pacific Northwest represents about 10% of the national P&P production total, this suggests that MagnaDrive's domestic P&P annual market potential ranges from \$30 to \$180 million.

We applied the 10% Pacific Northwest energy share to the national P&P motor total of 100,000 for the P&P industry to derive a baseline Pacific Northwest energy estimate of 10,000 GWh annually. Combining these usage figures with the 18% MagnaDrive Coupling savings estimate and the cumulative MagnaDrive Coupling market penetration estimates in Table IV-5 yields savings ranging from 60 to 530 GWh annually in Northwest P&P facilities.

Market Potential Summary

It is difficult to quantify the market potential for MagnaDrive in both the WWT and P&P industries. The estimated ranges in this report are heavily dependent on the following:

- The continuing trend of higher energy prices
- MagnaDrive's ability to broaden its marketing channels to include an array of industry specific market actors: OEMs, distributors, manufacturer representatives, and engineering firms
- MagnaDrives's ability to attain scale economies and compete on both first cost and LCC bases

Given these and other assumptions, we estimate that the market potential for the coupling in these Pacific Northwest industries ranges from \$4 million to

\$26 million annually. This represents coupling sales ranging from about 300 to almost 4,000 units annually.

The low ASD penetrations in these industries represent a significant opportunity for MagnaDrive and its ASD competitors. There are large numbers of motors at each facility, and the people we interviewed indicated that there was high potential for more variable speed control. While non-energy benefits will assist MagnaDrive in the WWT industry, the company will have to compete on a price basis to gain a footing in the P&P industry. It appears that, if the price is right, the P&P industry will add variable speed control devices on large numbers of their motors. If prices do not change significantly, there will not be much additional market penetration of variable speed control devices in the P&P industry.

V. *Marketing and Promotional Materials Assessment*

The **quantec** team provided marketing assistance to the Alliance MagnaDrive Corporation through the following activities:

- Attended the Water Environment Federation's 73rd Annual Conference & Exposition on Water Quality and Wastewater Treatment (WEFTEC). The goal here was to gain insights into the dynamics of equipment purchasing in this important market segment for MagnaDrive's technology from the perspectives of various market actors and participants: equipment manufacturers and their representatives, dealers, distributors, engineering firms, and customers.
- Facilitated a WEFTEC debriefing session with the MagnaDrive executive team in Seattle following the conference. While the primary focus was relating market and sales distribution lessons learned from the water and wastewater treatment (WWT) segment's most important trade show, the discussion extended to other priority market segments, including pulp and paper (P&P). The goal was to determine MagnaDrive Corporation's progress in achieving its objectives as detailed in its business plan, and to share sales, marketing, and channels of distribution practices observed from those exhibiting at WEFTEC.
- Reviewed various collateral materials from within the context of the response of various market actors and participants at WEFTEC.

Background

The **quantec** team worked with the Alliance and MagnaDrive Corporation to establish a common language for this project: We agreed on the following definition.

Marketing: a set of strategic customer focuses and the related decisions a company makes regarding price, product, promotion, and product distribution, also known as channels of distribution. Taken together, these are the 4 Ps of marketing and need to be executed to mutually support each other in order to achieve company revenue and profit targets in the context of competition.

Pre-marketing plan development requires companies to answer the following questions:

1. What is our strategic focus?
2. What is our model/long term strategy?
3. What are our core competencies (what should we do in-house/what should we buy)?
4. What degrees of freedom do we have to achieve marketing goals (how many resources, financial, time utilization, etc.)?

MagnaDrive is an emerging stage development company. Since being approved for the Alliance funding, the company has additionally raised equity capital and has transitioned from being a pure technology company to a company with professional management, product development and an emerging sales and marketing capability.

As MagnaDrive continues to develop, its business functions, sales, and marketing activities are being proved. Since the start of the Alliance's Phase 2 funding effort, the company has accomplished the following activities:

- recruitment and hiring of additional professional sales employees
- recruitment and hiring of in-house sales administration support
- preparation and attendance at WEFTEC and other trade shows.
- capturing sales leads from WEFTEC and incorporating them into a sales callback selling system
- MagnaDrive has quoted and is in process of closing sales agreements with prospects first met at WEFTEC
- revision of its videotaped company and technology introduction (not viewed at the time this is being written)

Achieving revenue goals and profitability through sales of the coupling may become a moot point, however. The company, as detailed in its business plan,

has additional opportunities in other business sectors, including transportation. As the company explores its options for growth and development, licensing or OEM agreements may obviate the need for sales revenue from product sales to prove its business model.

However, for the company to grow more rapidly, an expanded sales and territory management capacity is needed. It seems improbable that the company can achieve its planned growth by selling directly from its Pacific Northwest headquarters.

MagnaDrives's business and critical path plan has set the period from the third quarter 2000 to the second quarter 2001 as the time to establish a US Sales Distribution Plan. This is currently a work-in-progress, and in the view of the **quantec** team, the marketing area requiring the most attention at this time.

Distribution of Adjustable Speed Drives and Purchasing Processes

The Alliance's motor and adjustable speed drive (ASD) market study (Study)¹¹, provided important information on the channels of distribution for adjustable speed drives (ASD), focusing on distribution patterns and purchasing processes.

Distribution of ASDs

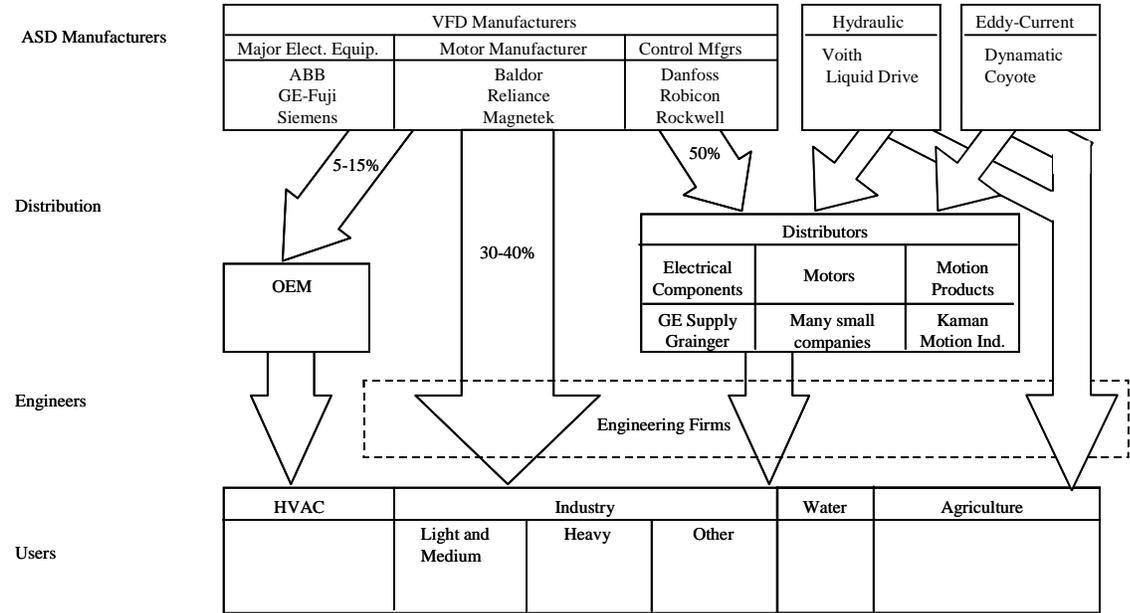
Several distribution channels were identified in the Study. Some of the most important include:

1. **Direct sales representatives**, who are salaried and prospect for applications with potential end-users and support the distributor network.
2. **Specialized distribution**, including manufacturers' representatives such as those who specialize in motion products and services, electrical components or motor distributors, etc.
3. **Technical and engineering specialists** who support the field by providing application expertise, detailed pricing of specific applications, and in some cases, installation oversight.

¹¹ "Variable Frequency Drives." prepared for the Alliance by Easton Consultants, Report #00-054, June 2000.

The distribution of ASDs is made through a combination of direct sales and sales through distributors, as shown in Figure V-1. VFD manufacturers sell approximately 50% of their volume through specialized distribution – motion products, motor, or electrical components distributors. Approximately 30% to 40% of their sales are direct to the end user, including a large portion of the over-500 HP units. About 5% to 15% of sales are sold through OEM manufacturers, a growing channel as VFDs are increasingly being designed into equipment. Hydraulic ASDs and the eddy-current drives are sold in a similar fashion, but with a greater portion sold on a direct basis, estimated at 60% to 70%, and the rest through distributors and OEMs.

**Figure V-1
ASD Industry Structure**



Purchasing Process

The Study indicated that there are three ways that a user can acquire an ASD – in-house staff purchase, an engineering firm recommendation, or as part of an OEM purchase.

1. ***Most of the purchases of ASDs are made through the in-house staff that is charged with identifying cost-saving or process-improvement opportunities.*** In-house staff involved typically includes maintenance, plant or building engineers, and a variety of other related titles. These acquisitions are on a project-by-project basis and are part of the ongoing process/plant improvement program that continually searches for cost reduction and improvements in process. These are often done on a retrofit basis and may be part of a larger process improvement project.
2. ***An engineering firm or consultant may identify an opportunity as part of a plant construction project, continuing engineering support, or a building management contract.*** In most of these situations, the purchase of an ASD will typically be part of a larger project, particularly in plant construction. Use of outside engineering support is usually found with the less sophisticated user groups, such as water and wastewater plants, where engineering firms may be on retainer or in commercial buildings where building owners often hire a contractor to manage the facility.
3. ***Purchase as part of an OEM package.*** While ASD sales through OEMs are still relatively small, they are growing as users develop increasing comfort levels with their use. With HVAC equipment, for example, there is a growing inclusion of ASDs in larger equipment packages by the major equipment suppliers – Trane, Carrier, and York.

Marketing to the Water and Wastewater Treatment Industry: Lessons Learned from the WEFTEC Tradeshow

Two members of the **quantec** team attended WEFTEC, the leading US-based industry trade event for the WWT industry. The purpose of the visit was to interview trade show participants on market dynamics, in particular WWT product promotion and distribution channel design and management, and to assess MagnaDrive's display area/technology demonstration.

Water and wastewater represent a large, complex, global and consolidating industrial sector. Market participants who attended WEFTEC included:

- **Legal, regulatory and governmental agencies** such as the EPA and state environmental and water quality departments
- **Public and private operators** such as the Portland Water Bureau and Intel
- **Engineering and design consultants** such as Ch2M Hill, R.W. Beck, Montgomery Watson, Bechtel, and Sverdrup
- **System suppliers** such as U.S. Filter, owned by Vivendi, a French multinational
- **Sub-system suppliers** (e.g., controls) such as GE Automation Services, ABB, and Emerson Electric
- **Equipment manufacturers** such as Fairbanks Morse Pumps, Cornell Pump, and Kaeser Compressors
- **VFD manufacturers** such as GE, ABB, and Danfoss
- **Chemical and Consumable suppliers** such as Praxair, an industrial gas process supplier, and A.ON, a chemical vendor
- **Specialty marketing companies** such as USA Bluebook, an industrial distributor, manufacturers' representatives, agents, and dealers
- **Water and wastewater service providers** including chemical analysis labs, disaster recovery vendors, and storm water service vendors, etc.
- **Miscellaneous business services** including insurance companies, investment bankers, publishers, and transportation companies

The size and scale of the various market actors observed at WEFTEC was equally broad, including corporations with annual turnover exceeding a hundred billion US dollars, to those 'boutique' or niche-specific firms, the size of MagnaDrive or smaller. Independent of size, each private sector company has finance, sales and marketing, and management requirements, which are in part a function of resources available to achieve objectives. For example, to achieve sales and market objectives, the French multinational Vivendi could potentially buy market share by acquiring companies and/or competitors. For smaller equipment or technology vendors, sales or revenue growth is typically resource constrained.

WEFTEC participants made varying communication and promotion commitments to the show. Market leaders had displays covering in the thousands of square feet, with complex demonstrations, planned media events and technical paper presentations, as well as well-manned booths, four-color brochures, marketing collateral (“take aways”) like bags, pens, and other items. Smaller companies usually displayed their technology or equipment; larger companies displayed their capabilities. All participants focused on a number of communication and promotion objectives:

- Corporate identity
- Communication to publics (media, financial media, technical audience, end user communication, ‘buying decision influencers,’ employees, channel partners, etc.)
- Company background
- Trade show booth design
- Display management
- Product description
- Product demonstration
- Performance profiling
- Pricing

WWT Distribution Channels

We informally interviewed ten randomly selected tradeshow participants with display booths at WEFTEC (Table V-1). The companies, representing a variety of sizes and industry segments, were interviewed about sales and marketing dynamics in the water and wastewater market.

**Table V-1
Interviews Conducted at WEVTEC**

Profile of Interviewee / Market Segment	Approximate Size (employees)
Single product company	< 200
Equipment manufacturer, technology leader	> 1500
Subsystem supplier; business unit of major multinational	> 2000
Well known supplier	> 1000
Multinational industrial gas vendor	> 2500
Engineering/Design consultant	> 10,000
Single product company	< 50
Engineering/Design consultant	> 500
Equipment manufacturer; business unit of larger Fortune Co.	> 150
Single product company	< 40

We interviewed representatives on duty at their company’s display booths and probed to understand their strategy regarding sales and their use of various channels of distribution (the place ‘P’ of the 4Ps or marketing mix variables). For some companies – the questioning gravitated to the procurement process, how large market actors ‘partner’ to win projects, how they use distributors, how small technology companies may want to approach attractive segments, etc.

The interview with the representative from the large engineering consulting firm was particularly insightful. When questioned on what the value-added distributors provide to his firm, he said that distributors’ primary value was providing pricing and technical specifications to be included in a proposal.

He continued by profiling different public sector clients. He stated that the useful life of a sewer project was 50 years and for a wastewater treatment facility it was 30 years. He claimed some localities were extremely risk averse to considering new technologies, while some, New York City for example, were progressive and invited vendors to demonstrate their performance. Further, he suggested a ‘tried and true’ method to win business from the New York City Waterworks Department (NYCWD) for new technology vendors: by installing a system and running it at no cost to the NYCWD, orders are often won once claims for efficiency are proven.

Smaller companies were better sources of information on dealing with the complex issue of channels of distribution. Some of the issues discussed were

channel design, channel management, and using multiple channel partners to achieve sales and revenue objectives. The representative of one equipment manufacturer, for example, provided valuable market insights. He formerly owned and operated a manufacturers representative business in this industry. He recently became an employee of the equipment manufacturer and is responsible for agent and distributor sales. The company sells throughout North America and worldwide, and he was probed on sales territory management. He mentioned that the company's primary method to motivate sales is lead generation through market promotion (advertising) and sharing leads with reps and distributors in geographic territories.

A representative from one of the single product companies is the West Coast sales and service representative. The company is currently well represented with a reference or installed base in the Midwest and Eastern parts of the US, but the company doesn't have the same advantage in the West, and is floundering without an effective marketing and distribution program.

Another single product company representative, recently recruited from a competitor, stated that channel marketing was complex and that it was a very 'relationship' driven form of business. The company sold direct to major accounts and used agents and manufacturers' representatives for hard to reach or hard to service accounts.

MagnaDrive's Presence at WEFTEC

A primary method for industrial product and technology market promotion is attendance in specialized trade shows. As MagnaDrive has identified the WWT market segment as one of its primary target segments, the company planned and operated a booth that provided demonstrations to a targeted and informed audience.

MagnaDrive exceeded the minimum corporation communication and market promotion threshold, and designed and developed world-class components of a total communication package. Corporate logos, letterhead and stationery, the display booth, the truck demonstration, show 'uniforms,' technical product descriptions, etc., all reached or exceeded market requirements.

As the firm evolves, there will be enhancements of its current set of communication tools, in particular an upgraded video. Sales engineers also hope to demonstrate the company's technology in a PowerPoint presentation using video clips.

The MagnaDrive demonstrations, which included both truck- and table-mounted units, were well attended and credibly presented. The corporate

logos, letterhead, equipment spec sheets, representative ‘booth uniforms,’ personnel selling style, and brochures were well received.

We observed multiple sales presentations at WEFTEC. At the demonstration booth, we observed operators and maintenance supervisors ask questions on pricing, installation preparation, specific performance attributes, and other questions that were be considered ‘motivated buying questions.’

MagnaDrive’s sales organization was friendly, enthusiastic, and positive regarding the product and its capacities. The company’s professional sales skills are very good.

Summary of Findings

The lessons learned from the market actors at the WEFTEC tradeshow complement the findings from the WWT customer interviews reported Section III:

- Engineering firms rely on distributors for price and technical information to be included in their proposals to WWT customers. Many customers, in turn, rely on engineering firms’ recommendations for equipment purchases. The distributors therefore become a critical and essential link between MagnaDrive and WWT customers whose purchasing decisions are influenced by the engineering firms.
- The New York City anecdote about by installing a system and running it at no cost to the NYCWD, with orders won once claims for efficiency are proven, may be an attractive method for MagnaDrive to encourage early adoption among WWT agencies. This technique would also be applicable to P&P customers, who expressed a requirement for demonstrated performance and reliability.
- At MagnaDrive’s stage of development, additional investment in market promotion should be focused on lead generation, trade show participation, and providing selling tools to direct and channel marketing partners.
- MagnaDrive’s greatest marketing challenge, as identified in the company’s business plan, is developing US distribution.
- The executive team at MD is very aware of and very expert at understanding and implementing corporate communication requirements.

Appendix A. Interview Instruments
