TRW

TRW is a US-based multinational that is in the process of converting its business focus from the public to the private sector. Its CEO has mandated that all division managers are to assess the feasibility of converting their products to commercial use. Most understand that their future employment is dependent upon finding and developing a business plan for commercialization of such products.

The High Performance Metals Group

James O'Malley, head of HPMG, has a number of potential products for commercialization and is reviewing the work done by one of his groups on CMSS. Curled Metal Shock System was first developed for the US NASA space program in the mid-1980s. The launch process for the space shuttle subjected the craft to violent vibrations and there was a need for a shock dampening system that was both vibration effective and heat neutral. Many systems were successful on the first factor but few could do so without creating excess heat, a factor extremely important given the fuel load of the space shuttle. The CMSS technology solved this problem and is now considered the global industry standard for space programs.

The CMSS commercialization group was given the challenge of finding uses for this technology in the private sector. They studied many areas and developed several options. Their top priority, which O'Malley had in his hand, was the pile driving industry. O'Malley was very skeptical but read on anyway.

This case was written by Professor William Lawler of the F.W. Olin Graduate School of Business at Babson College as a basis for class discussion rather than to illustrate either effective or ineffective handling of an administrative situation.

The Pile Driving Industry

Market size, growth projections and segments

In the US alone, close to one-half billion feet of piles were driven in 2000. Given recent Federal safety legislation regarding building codes such as those enacted by the state of California after the 1998 Oakland earthquake, this figure is expected to grow at a minimum of 15% per year. The global market is conservatively estimated at four times the US with a growth rate almost double the US. Clearly, this market is large enough to sustain a viable business if products developed with TRW technology can compete.

Although segmentation can be done in many ways, the group felt that the most relevant one was by business purpose. In the US there are a few high-volume pile-driving sub-contractors who own a large number of hammers, employ crews on a salary basis, and have a sizeable backlog of jobs. It is estimated that they hold about 60% of the US market (in foot of pile driven). The rest of the market is comprised of large general contractors that, rather than sub-contracting, do their own pile-driving in-house. These companies can be further divided into two groups: those that own a few hammers and those that lease the equipment. Both hire crews from the union hall on an as-needed basis. About 30% of the US market falls into the former and the remaining 10% in the latter.

The pile driving process

The pile driving process is as follows:

1. A job would be defined by the number and type of piles, and the feet to be driven. For instance, 500 80 foot, 14-inch, steel H beams to be driven 75 feet into the ground.
2. The project general contractor would either put the pile-driving out for bid or, if large enough, would have it done internally.
3. The pile-driving technology, called hammers, would be brought on site and work would commence.
4. For every hour driving piles approximately one-half hour would be spent in moving and aligning the hammers.
5. Although the hammer technology is relatively sophisticated, the key to this process is the technology used to transfer the energy from the hammer to the pile. The shock from the hammer striking the pile can damage both hammer and pile. To mitigate this, a "helmet", consisting of a number of cushioned pads, is placed on the pile. The pad design challenge is to transfer the maximum energy with the minimum shock from the hammer strike and heat from the friction of the strike.
6. After a given number of strikes, the set of pads would be replaced and the process repeated. Most jobs require many set replacements. This is time consuming and sometimes dangerous due to the weight of the pads and their temperature, which can reach 250°C.

Competing products and distribution channel

Although hammer technology has made tremendous strides in the recent past, helmet technology is still relatively unsophisticated. Basically, a pad is four inches thick with three layers of half-inch stainless steel around two layers of one-inch insulating material enclosed in a plastic coating. A typical 16-inch diameter pad weighs about 30 pounds and approximately 12 such pads are inserted into the helmet. The pads sell for about $15 each.

The distribution channel of these pads is not well established and somewhat fragmented, a reflection of relative lack of industry attention to this class of products. Heavy construction supply houses carry them, pile manufacturers sometimes offer them as a service, and hammer sales and rental/leasing companies sometimes sell them. No pads manufacturers seem to dominate the market. In fact, most pads are distributed without any brand.

The decision making process for purchasing the pads is also ambiguous. Through a series of individual and focus group interviews with independent pile-driving subcontractors and general contractors, however, the CMSS group has learned that three types of external purchase influencers exist.

First, there are a number of manufacturers that sell piles, helmets, and pile hammers. For the most part, these manufacturers do not carry large inventories of pads. However, they either make recommendations as to where the pile drivers can get the pads or get the pads for them as a customer service.

A second group of influencers are architectural/consulting engineers. Because pile driving is critical to support expensive projects, thorough analyses and mathematical modelling are conducted by architectural/consulting engineers. They are regarded as the authorities on many aspects of the construction project business. These firms, therefore, willingly provide very detailed, specific instructions or 'strong recommendation' for materials, techniques, and methods to be used in a project. They almost always specify piles and hammers and frequently mention pads.

Finally, pile hammer distributing and renting companies seem to have an important influence because they often provide the pads for those smaller general contractors that lease the equipment.

With respect to the pile drivers (i.e., the users), the CMSS group has learned that large general contractors that do their own pile driving, typically participate in the bigger projects and are technically most sophisticated – some not only drive the piles but also design jobs, specify materials, and even manufacture their own equipment. The group feels that independent pile-driving subcontractors are very knowledgeable about the practical aspects of pile driving, but not as sophisticated. They also seem to be very price sensitive – much more so than the general contractors, small or large.

The CMSS Opportunity

The CMSS group thought that since the market is both large and growing and that they can produce a curled metal pad that would be much superior to the existing pads now on the market, this should be considered an opportunity. Although the existing price point of $15 was discouraging, they did develop a prototype product and had tested it on a number of jobs. They felt that their last test, a Los Angeles highway project where they convinced the pile-driving sub-contractor to use both conventional and CMSS pads, was most indicative of the advantages of their technology.

Los Angeles test data

The project called for 500, 75 foot, 14-inch steel piles driven 60 feet into the ground. The winning bid had been $9 per foot driven or $270,000 (500 x 60 x $9). Half the job was done with each pad technology and the results were extrapolated for the entire job as follows:[1]

	Conventional technology	CMSS technology
Feet driven per hour while hammer was at work (ignoring move and align time)	150	200
Piles driven per set of pads	20	250
Number of pads per set	12	5
Number of sets required	25	2
Time required to change a set	30 minutes	15 minutes
Cost per set	$180	not applicable

Other relevant data

1. Equipment costs to operate a hammer average about $200 per hour, which includes fuel, maintenance and depreciation. Interestingly, this does not vary if one owns or rents the equipment since the leasing market for this type equipment is exceedingly efficient.
2. Labor cost for this type job, including the hammer operator, support personnel and supervisor, averages about $100 per hour.
3. Likewise, overhead, which includes tooling costs, transportation of equipment to job site and incidentals, is typically allocated to jobs at about $220 per hour.

[1] Data set was adapted from data in *Cumberland Metal Industries*, HBS 580-104.

4. Operating expenses such as marketing, sales, finance and corporate administration average 15% of revenue for this industry.
5. The cost for the CMSS group to produce one pad is as follows:

Material	$37.50
Labor and traceable overhead	20.00
Traceable costs	57.50
Corporate overhead allocated at 400% of traceable cost	230.00
Total cost of production	$287.50

The unfinished piece

O'Malley is now intrigued by this opportunity but the report is unfinished. The group has been unable to develop a market introduction plan, specifically the pricing element, and how each segment would view the value added by the CMSS technology. They did, however, compile a profitability report for the Los Angeles job using the conventional pads as a starting point (see Exhibit 1).

Exhibit 1

Los Angeles Test

	Conventional technology	
Hours:		
Driving	200.0	500 piles x 60ft/pile divided by 150ft/hou
Moving & Alignment	100.0	50% of drive time
Changing pad set	12.5	25 set changes @ 30 minutes each
Total hours for job	312.5	
Profitability		
Revenue	$270,000	Given
Expenses:		
Equipment	62,500	312.5 hours @$200/hr
Labor	31,250	312.5 hours @$100/hr
Pads	4,500	25 sets x 12 per set x $15
Overhead	68,750	312.5 hours @$220/hr
Operating expenses	40,500	15% of revenue
Total expenses	$207,500	
Operating profit for job	$62,500	