Dominion Motors & Controls, Ltd.

Dominion Motors & Controls, Ltd. (DMC), had acquired over 50% of the available market for oil well pumping motors in the northern Canadian oil fields since they were discovered in 1973. Although the company was a large supplier of motors and control equipment in the Canadian market and had an excellent reputation for product quality, DMC executives believed it had been especially successful in this market because of one salesperson hired in 1974. He was both aggressive and capable and could "talk the oil people's language." He had gained experience in Texas in electrical equipment sales and oil field electrical application engineering. At that time none of DMC's competitors had salespeople in the area with similar skills. The company, therefore, was able to establish an early foothold and develop a strong market position.

Early in 1985, however, DMC was threatened with the loss of this market because of tests performed by the Hamilton Oil Company. Hamilton was the largest oil company active in Canada; it owned and operated over 30% of the total producing wells. John Bridges, head of Hamilton's electrical engineering department, who was in charge of the motor testing program, had concluded that DMC's motor was third choice behind those offered by Spartan Motors, Ltd., and the Universal Motor Company of Canada, respectively. Thus, in March 1985 executives of DMC had to decide what action, if any, the company could take to maintain its share of the oil well pumping market.

Company Background

Dominion offered a line of motors ranging from small fractional horsepower (hp) units to large 2,000-horsepower motors. The company also produced motor control and panel-board units, which would automatically control and protect a motor. In 1984 DMC sales approximated $323 million and were distributed among the following product groups:

Product Group	Sales ($ millions)	Unit Sales
Control and panel boards	$72	NA
Fractional horsepower motors	126	500,000
1-200 hp motors	85	22,000
250-2,000 hp motors	40	700

Professor E. Raymond Corey prepared this case as the basis for class discussion rather than to illustrate either effective or ineffective handling of an administrative situation.

About 80% of DMC sales were made directly by company salespeople to original equipment manufacturers (OEMs) and large industrial users, such as oil companies, paper mills, and mining concerns. Approximately 20% of sales were made to distributors for resale, primarily to small users (small drilling contractors and others) and small OEMs. DMC's discount schedule for various classes of purchasers appears below.

Purchaser	Discount	List Price Multiplier
OEm	45%	.55
Reseller	40	.60
Large user	38	.62
Small user	25	.75

Oil Well Pumping Motor Market

Major oil fields were discovered in northern Canada late in 1973. By 1984 there were approximately 5,500 producing wells in these fields, of which 850 were started in operation in that year. Hundreds of oil companies were active in the area, but only about 25 owned 50 or more wells.

According to industry estimates, an average of 1,000 new wells would enter production each year for the next five years. Estimators were careful to point out, however, the difficulty of making such forecasts with any degree of accuracy. Actually, many people intimately acquainted with the young Canadian oil industry believed that this estimate might prove low. Because of rapid changes in world economic and political conditions and technology, forecasting was most difficult. Sales to this market were seasonal; over 80% were made between April and September.

Dominion's competition consisted of other well-known Canadian motor manufacturers and a number of foreign competitors (particularly British, German, and Japanese firms).[1] All the Canadian manufacturers maintained closely competitive pricing structures. Foreign competitors, however, usually sold 10% to 20% below the Canadians' established prices.

Dominion salespeople attempted to sell a motor and control unit as a package. Frequently, however, oil field customers bought the motor of one manufacturer and the controls of another. The majority of DMC's competitors did not offer motor controls. The main sources of motor control competition were control manufacturers.

From 1973 to 1984, DMC sold about 15% of the control and panel-board units used in oil well applications. The average pump system installed to deliver oil from a proven well cost about $34,000. Approximately $5,000 of this was invested in electrification of the pumping installation (motor, controls, wiring, installation, and so forth). The motor itself accounted for approximately one-third of this $5,000 investment and the control and panel-board units another 30% of this amount.

1. Many U.S. motor manufacturers operated Canadian subsidiaries, which were considered Canadian competition.

The Buying and Selling of Oil Well Motors

Large Canadian oil producers were typically organized so that production (removing petroleum from the ground) was separated from refining (making the petroleum into useable products, such as gasoline and lubricants) and marketing. The production organization in the larger companies typically included field operations people (who managed the rigs themselves), engineers, purchasers (who actually ordered the equipment), geologists (who assessed the likelihood of finding oil in different locations), and standard administrative functionaries, such as personnel and legal staff. Field operations were generally organized geographically with regional directors, district managers, rig supervisors, and also foremen for each shift and for the special functions such as maintenance. Rig supervisors were in charge of operating the rig itself and were viewed as important people. They typically were experienced hands who had worked up from entry level positions. They played a major role in rig operations, and their opinions about machinery were respected by other oil company personnel. Engineering designed and specified equipment, such as the rotating drilling platforms, and included primarily mechanical and a few chemical engineers.

Normally, salespeople called on their customers to keep them abreast of changes in the line and to nurture the relationships they had developed over the years. The people they called on in the large companies varied: in some cases they were top executives; in others, engineers; and in still others, operations managers, rig superintendents, and a variety of related rig personnel. During these calls the salespeople often obtained leads on companies believed to be contemplating expansion or overhauls.

The smaller companies had simpler organizations. The very small ones often owned only a few rigs, sometimes only one. These operators did no refining, but sold their production to the large, integrated producers. Few small operators had separate engineering departments. They tended to comply more with industry standards in their buying and often followed the larger companies in purchasing policies and equipment choice.

Dominion's Advertising and Promotion Programs

Dominion had an advertising program that management considered of limited value in making sales but useful in helping the salespeople. Trade journals were used to reach the different buying influences.

Although management did not expect its advertising actually to produce sales, it was strongly opposed to a mere business-card style of advertising in trade papers. It made every effort to present effective selling copy and layout. The advertisements often pictured actual installations with fairly long accompanying sales arguments.

Catalogs were important in DMC's promotional program. Each motor size was described in a general catalog distributed to purchasing and engineering personnel. This single-publication approach, in contrast to pamphlets describing each motor, was difficult to revise. But management believed that the catalog was lower cost and more efficient than individual pamphlets because the product line was quite small and the motor designs and specifications were seldom changed.

Factors Affecting Specifications of Oil Well Pumping Motors

Approximately 80% of the motors sold for oil well pumping applications since 1973 had been 10-hp NEMA[2] design C (high starting torque, low starting current), totally enclosed, fan-cooled units with moisture-resisting insulation. The remaining 20% of sales were motors of the same type but with higher or lower horsepower ratings.

Such factors as drilling depth, oil viscosity, water content of pumped fluid, underground pressure, and the government-controlled production allowables in the northern Canadian fields had determined the type of motor best suited for this area.[3] One particularly important determinant had been the low winter temperatures which required a motor with a high starting torque.[4] To be assured of sufficient starting torque, many oil companies were using 10-hp motors even though these were larger than was actually required to lift the oil to the surface. This practice was called "overmotoring."

During 1984 power companies serving the oil fields made two announcements that could affect the specifications of oil well pumping motors. First, their schedule of power rates was changed. The former flat rate, charged regardless of the horsepower of motors on a pumping installation, was replaced with a graduated schedule based on connected horsepower of an installation:

Horsepower of Installation	Monthly Base Charge per Horsepower
5	$25.00
7½	21.50
10	20.00

Second, power companies demanded that their customers stop overmotoring and improve the "power factors" of their installations.[5] They did not, however, indicate at the time what, if any, penalty overmotoring would incur.

2. National Electrical Manufacturers Association was a nonprofit organization to which the great majority of electrical manufacturers in the United States and Canada belonged. It developed and promulgated standard specifications for electrical equipment. Adherence to the standards was entirely voluntary; neither members nor nonmembers were precluded from manufacturing or selling products that did not conform to them.
3. The characteristics of oil fields yet to be discovered could easily differ from those of existing fields, and, therefore, other types of motors might come to be required.
4. Starting torque, expressed in pounds-feet, was the twisting or turning power of the motor, which enabled it to overcome initial load resistance.
5. **The power factor** of an a.c. circuit was defined as the ratio of power-producing current to total current. In most a.c. circuits, both magnetizing current (which did no work) and power-producing current were conveyed. If no magnetizing current was present, the total current equaled the power-producing current and the power factor was unity or 100%. In motors working well below their rated capacity, much magnetizing current was present and the power factor was quite low. The lighter the load relative to the motor capacity, the lower the power factor.

The watt-hour meter used to determine a customer's power bill recorded only power-producing current, so when a utility system had to carry nonpower-producing current, its income and ability to carry payload, or power-producing current, were reduced. Consequently, more facilities were required to serve a low power-factor load than a high power-factor load of the same kilowatt (pay-load) demand.

Hamilton's Field Test Program

Following these announcements, John Bridges, Hamilton's chief electrical engineer, initiated field tests on oil well pumping motors. His objective was to define the specifications of a motor which could be used most economically. The tests, therefore, were to determine (1) the horsepower required to lift the fluid, and (2) the maximum starting torque required to start the pumping units at low winter temperatures.

Although the tests were completed by early 1985, DMC executives became aware of them in March only through the reports of a salesperson calling on Hamilton. Although the salesperson was unable to obtain a memorandum describing the test procedures and findings, DMC executives pieced together what they believed to be a fairly accurate picture of the conclusions.

According to their information, Bridges had determined the following: (1) fluid-lifting requirements dictated a 3- to 5-hp motor; (2) starting torques in excess of 70 pounds-feet would energize the pumping units at temperatures as low as -50°F; (3) this starting torque requirement would necessitate a 7½-hp motor; and (4) because the Spartan 7½-hp motor had the highest starting torque of the motors tested (see **Exhibit 1**) and the Universal 7½-hp motor had the second-highest, these should be his company's first and second choices in the future. Dominion's 7½-hp motor would be the third choice. Management at DMC also learned that Bridges planned to report his findings formally to Hamilton's executives in May.

Dominion executives believed these tests had not produced data sufficient to define oil pumping requirements accurately. They did believe, however, that the findings had provided rather specific indications of pumping needs under a given set of operating conditions.

DMC personnel were extremely concerned, nevertheless, about the probable effect that Hamilton's endorsement of the Spartan and Universal motors would have on Dominion's market standing. Bridges was known to be very influential in establishing Hamilton's purchasing policy.[6] In addition, because Hamilton was the only firm operating in the Canadian oil fields that maintained an electrical engineering staff, Bridges's recommendations would probably carry great weight in the entire industry. Most DMC executives believed, therefore, that they could not hope to stay in the oil well pumping market unless they responded somehow to Bridges's challenge.

Possible Solutions to Dominion's Problem

Four courses of action were developed by Dominion executives:

1. Reduce the price of DMC's 10-hp motor to that of the 7½-hp motor.

2. Reengineer DMC's present 7½-hp motor to make its starting torque at least equal to that of the Spartan 7½-hp unit.

---

6. All oil well pumping motors used by Hamilton Oil Company were procured through its production department, and most of the motors this department purchased were for oil well pumping. Other departments independently purchased large numbers of motors either directly from manufacturers or through contractors. Motors used in refineries, for example, were typically acquired as original equipment through the contractors who built the refineries. Motors for an average oil refinery in Canada cost between $250,000 and $1,000,000.

3. Undertake design of a definite-purpose motor for the oil well pumping market. This ideally would be a basic 5-hp motor with the starting torque of a 10-hp unit.

4. Attempt to persuade Bridges and Hamilton executives that the conclusions reached from their test results unduly emphasized obtaining the **maximum** starting torque available.

Alternative 1. Reducing the price of DMC's 10-hp motor to the level of its 7½-hp unit was advocated by several executives as a quick initial way to meet the problem. Such a move, they thought, could be taken either immediately or as late as May 1985. These executives pointed out that the oil well motor market was rapidly becoming active after its usual winter slump and that if the company wanted to share in the 1985 sales, DMC must gain a competitive position immediately. They recognized that this would not be a long-run solution. It did appear, however, that a 10-hp motor could continue to be acceptable for the short run because the savings from using a 7½-hp instead of a 10-hp motor were not large and because no oil company had yet been penalized for maintaining low power factors. (**Exhibit 2** shows the cost and prices of the small motors in DMC's line.)

Some executives argued that there was no need to reduce the price of the company's 10-hp motor until Bridges delivered his formal report. They doubted that many oil companies would hear of the results until the formal report, so there might not be much effect on motor purchases for another two or three months. Dominion could continue selling its 10-hp motor at the usual price until it encountered objections and the market became aware of Hamilton's endorsement of the Spartan motor.

Executives who favored this alternative believed it would immediately combat Hamilton's endorsement of the Spartan motor. It would be a useful temporary competitive measure until they could obtain and completely study Bridges' test results. Then DMC could reach a more satisfactory and reasoned strategy decision. They believed that adequate appraisal of Bridges' tests, results, and conclusions might require as much as one year, especially if company executives wanted to have DMC's own engineers make comparative tests.

Alternative 2. Several company executives believed that DMC's best opportunity to stay in the oil well market lay in reengineering its existing 7½-hp motor to give it a starting torque equal to or greater than that of the Spartan 7½-hp motor.[7] Initial investigations revealed two ways of increasing starting torque.

First, at least 105 pounds-feet of starting torque could be obtained by modifying the existing 7½-hp internal motor components. This motor would have the same frame size (i.e., mounting dimensions) as the existing 7½-hp motor, but its temperature rise would be greater than NEMA standards. This departure would not, according to DMC personnel, significantly alter the safety or operating characteristics of the motor, because special high temperature insulation would be used. These executives were uncertain, however, how oil field users might react to an operating temperature above NEMA standards. A manufacturing cost of $790 would be incurred to produce this motor.

---

7. Under this alternative DMC's present 7½-hp motor, with a starting torque of 89 pounds-feet, would continue to be manufactured and sold to customers who had no need for or interest in high starting torques.

A second way to obtain the same starting torque was to use a larger motor frame. This motor would continue to meet or exceed all NEMA's minimum standard performance specifications, but not NEMA mounting dimensions for its rating. Executives at DMC believed, however, that standard motor mounting dimensions were not important in oil well pumping applications. They also believed that such a motor would meet less customer resistance than one that exceeded NEMA's maximum temperature rise. The manufacturing cost of this motor would be $867.

Neither of these methods would involve additional investment in plant or equipment. It would take approximately three months to begin shipment of the modified motor.

Advocates of altering the company's existing 7½-hp motor to increase starting torque believed this was the answer to the product problem. They pointed out that "souping-up" would give DMC a motor with the highest starting torque of any 7½-hp motor then available.

Not all DMC executives agreed that this alternative would be desirable, however. They pointed out that such a move would invite a torque war, which could lead to unbalanced motor designs.[8] This could confuse motor users and be detrimental to the motor industry as a whole. It had long been DMC's policy to support industry standards by not publicizing or claiming operating characteristics in excess of NEMA standards. The company had excellent testing facilities, which enabled engineers to design motors close to NEMA standards and thus reduce costs. One executive stated, "There is no point in building more margin into our motors than required by the NEMA standards. . . . Our better testing facilities allow us to design closer to NEMA standards than our competitors. . . . There is no point in building a large margin into our motors."

Alternative 3. A number of DMC's executives supported a move to design a definite-purpose motor for the oil well pumping market. They felt this was the only way to regain effective product leadership. The Hamilton tests, they pointed out, indicated that the specific motor desired would have the running characteristics and rating of a 5-hp unit but the starting torque of a 10-hp motor. This motor would exceed minimum NEMA specifications. They reasoned that such a unit would have unquestioned competitive superiority in this market. Preliminary examination indicated that the motor could be produced at a manufacturing cost of approximately $665.

Executives believed that such a motor could be successfully sold at a net price of $1,045 to large users. They reasoned that the definite-purpose motor should be priced close to the 5-hp general-purpose motor because it was actually a 5-hp motor. Also, it would be priced below the 7½-hp general-purpose motor to give DMC a price advantage over the competition's 7½-hp motors. Some managers, however, believed a definite-purpose motor could be sold for somewhat more than $1,045 and perhaps more than a current 7½-hp motor. An investment of $75,000 was believed adequate to provide the required engineering and testing. Executives believed only minor expenditures for plant and equipment would be necessary to produce the new motor. Engineers estimated that it would take four to five months for production to begin.

Those who favored this alternative summarized its merits by noting that DMC would be offering the market **exactly** what it wanted. Furthermore, they believed that the first manufacturer to offer a definite-purpose motor, tailored to the needs of the market, would have an important

8. This was described by one executive as technical inflation.

tactical advantage over competitors, which could be expected to last a long time. They felt that with such a motor DMC could increase its share of the oil well pumping market to approximately 60%.

With few exceptions the Canadian motor industry had adhered to general-purpose motors—designed to be acceptable for a number of applications. As a rule their performance characteristics exceeded the specific requirements of any individual application. Some industry executives believed that this philosophy (based on NEMA standards) had been the salvation of the Canadian motor industry. They pointed out that the Canadian motor market was less than one-tenth the size of the U.S. market, making it economically difficult to justify small production runs of special-purpose motors. Manufacturers had concentrated on standard, general-purpose motors to achieve unit costs competitive with those of imported motors.

Alternative 4. Several members of DMC's management group believed that Bridges's conclusions were not completely accurate. They argued that before considering changes in product and market strategy, they should attempt to persuade Bridges and the executives of the Hamilton Oil Company that another set of conclusions could be drawn from the test results. Several DMC executives knew Hamilton's purchasing vice president socially and believed that perhaps they could approach him.

These executives pointed out that all 7½-hp motors tested had starting torques in excess of 80 pounds-feet (see **Exhibit 1**) and therefore should have been satisfactory, because 70 pounds-feet of torque was deemed capable of "breaking" a pump in the most extremely cold weather. Apparently Bridges had reasoned that because starting torque was the most important feature in oil well pumping motor applications, he should get as much of it as possible. The Spartan motor was his first choice because it had the highest starting torque. Most DMC executives believed that the instances when 80 pound-feet of torque would not start a motor would be extremely rare, but, as one expressed it, "Engineers love big margins whether they use them or not."

Many company executives believed that there was real reason for questioning Bridges's conclusions, but they did not know how to present different arguments. Bridges was scheduled to present his conclusions early in May to Hamilton's top management. Several DMC executives close to the situation reported that Bridges was convinced of the validity of his interpretations and showed an intense pride of authorship. They believed it would be very difficult to approach him directly. Some felt that nothing but ill will could be generated by any attempt to alter Bridges's recommendations.

Dominion executives were united in their concern that, although Bridges had begun his tests in October 1984, they had not known of them until March 1985. Most believed that the present problem would never have arisen had they known of Bridges's tests when they first started. Although most executives were not in favor of encouraging a trend to definite-purpose motors, they did feel that when a customer was attempting to define its motor needs precisely, DMC personnel should work with the customer so the company could be in on the ground floor of subsequent developments.

Some executives believed that DMC personnel should go one step further and begin testing and defining the motor needs of the company's various market segments in preparation for when a customer (such as Hamilton) might conduct an investigation itself. Executives who supported this policy believed that such work could be looked on as a long-term investment in maintaining DMC's future market position. Company engineers, however, were already overburdened; and so a program such as this one would necessitate additional hiring.

Exhibit 1 Maximum Starting Torques of Motors Tested by Hamilton Oil Company (in pounds-feet)

Horsepower	Starting Torgue by Motor Manufacturer Spartan	Universal	Dominion	Minimum Starting Torque Required by NEMA Standards
5	68	65	60	57.7
7½	102	97	89	76.5
10	110	109	105	101.5

Exhibit 2 Costs and Prices of DMC's Small Integral Motors

Horsepower	Manufacturing Cost[a]	Total [b] Cost	List Price	Prices to Large Users
5	$ 511.53	$ 571.20	$1,685	$1,045
7½	663.51	714.00	1,940	1,200
10	816.00	907.80	2,550	1,580
15	1,229.10	1,371.90	3,725	2,310

[a]Manufacturing cost includes direct labor, materials, and other variable manufacturing costs.

[b]Total cost includes manufacturing cost and charges for fixed manufacturing overhead, engineering, transportation, sales service, advertising, administrative overhead, and depreciation. It does not include sales commissions (8% of net sales billed) or transportation costs (2% of net sales billed).