Profit and Technology Transfer

Earning prosperity through better use of intellectual property is worthy objective

BY PETER L. WAITE*

I believe it was a former Canadian Prime Minister who once said, "The English instinctively admire any man who has no talent and is modest about it." This philosophical nicety allows me to thank you, my hosts here in Canada, for affording this Englishman the privilege of addressing you today and also serves to introduce the subject of talent in the form of technology or intellectual property, its development, its sale and therefore its transfer to the bottom line.

I am going to open my address by breaking the first law of presentation dynamics. I am going to start by making excuses.

In drawing up my thoughts on how best to address this subject, I concluded that I was ill-equipped to speak generally, that in any event generalizations were unlikely to be satisfying to such an audience as this and that a more specific viewpoint could provide greater appeal. Quite unashamedly, therefore, I am going to provoke the English modesty to which I have referred and speak from the viewpoint of a service company — my own company — a company that, more and more, is dedicating itself to the pursuit of invention and the subsequent sale for profit through license of the right to third parties to utilize those inventions. It is a company that believes that, in so doing, it is fulfilling an ever-increasing market gap and an ongoing need to transfer know-how to capitalist, totalitarian and developing countries. But, perhaps more importantly, it is a company that is not just paying lip service to research and development and the generation of proprietary technology, but making a successful living from it. In other words, ours is a company that really is transferring its technology to the bottom line. I will therefore be taking you through the why's and wherefore's of the Davy philosophy and experience before attempting to draw some broader conclusions.

So, having made my excuses and hopefully obtained your indulgence, let me open my commercial by quoting from the Chief Executive's Statement in the Davy 1986 Annual Report:

"Our success and our progress toward increased profitability generally has been, and will continue to be, based on the fund of first-class modern technology we offer to industry throughout the world. The expansion of this technological base is our principal and continuing objective, and one which is to be achieved by our own research and development activity, through licenses, and through new contracts which provide development opportunities."

This element of our strategy has, to a large extent, been developed as a result of our recognition and adaptation to market forces. But it is also a conscious decision to dedicate our talented resources to the production and provision of unique, commercially salable technology that will enable us to offer "something special" in the marketplace rather than compete forever in the cutthroat milieu of me-too engineering. It is therefore our policy to develop and utilize our in-house talent to fulfill this technological need and also to fill what we see as an important gap in technology transfer.

Creating

Of course, converting this strategy to a reality is infinitely more difficult than developing the strategy itself. So I will be drawing your attention to the changes in management style, the effort, the skills, the cost factor and the market forces we have had to accommodate in order firstly to develop unique, advantaged technology, and secondly, to commercialize and profit from its sale to others. Remember, too, that because we are not a producer we generally have to achieve our sales, and therefore our profits, by breaking into existing markets controlled by others. Very occasionally we can influence or contribute to the development of new markets but, on both counts, a lesson we have quickly learned is that creating change can often create real antagonism -- to coin Woodrow Wilson, "If you want to make enemies, try to change something." I will return to this later, but before I delve into the extent to which we are changing the source of our profit, let me outline the more traditional base that we are leaving behind.

Davy is an international engineering contractor with offices throughout the world. Turnover and profit have been, and still are, created by designing, procuring and erecting plants for major investors, worldwide, in many areas of technology, be they iron and steel, metals and minerals, petroleum and chemicals, fibers and plastics, pharmaceuticals, biotechnology or whatever. Our concept has been to have our offices specialize in particular technologies or act as centers of excellence, but combining wherever beneficial to cover as wide an investment area as possible. The width of the spectrum of specialty is deliberately designed to smooth out the peaks and

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troughs in investment potential, thereby enabling as far as is ever possible reasonably reliable growth and profit pattern to be obtained from our engineering and erection services. Indeed, this concept has seen us survive a tremendous reduction in investment and hence the need for services in the traditional profit areas over the last few years, but it has also gained for us a launching pad from which to increase our technological expertise into new and profitable ventures.

Assignments

Over the years, engineering contracting companies like Davy have been given assignments by clients to build plants, either to the client's design or utilizing know-how provided by or licensed through third parties. As a result, engineering contractors have developed the ability to harness engineers to design, specify and estimate the cost of installing a wide variety of manufacturing plants, and then harness even more engineers to produce the design detailed drawings using all the traditional disciplines such as chemical, mechanical, civil, piping, instrument and electrical engineering etc.

Traditionally, the engineering contracting industry has sold its engineering skills through the form of reimbursable manhours in the Western world, but in the Eastern Bloc and Third-World countries it has normally been necessary to sell a fixed or lump-sum price for the technology and related engineering services, as well as for the total equipment and its installation and commissioning. Either way, contractors have thereby become important cogs in the transfer of know-how and technology around the world, be it patented or not, and, as a result, gained a detailed knowledge of the licensing requirements for the transfer under many different circumstances and contract philosophies.

My own company has deliberately specialized in developing and selling proprietary, added-value technology and, more importantly, has been prepared to commit to an aggressive risk: Reward ratio for the provision of that technology rather than just providing engineering manhours per se. This has proved to be an important factor in deriving an advantage over many of our competitors, albeit the added risk has required enhanced project management skills and the containment of that risk has generated the occasional bout of heartburn or apoplexy at board level. In the early years, most of this added-value technology and related know-how was obtained through license from others and we directed our efforts to researching the marketplace to establish perceived future need and then to seeking out the best and most applicable sources of technology, wherever they may be. Researching, examining and exploiting that obtained or licensed technology required considerable talent and we were proud of that talent. But all too clearly we realized that we had no exclusivity on its ownership. We have therefore, despite the associated costs and overhead pressures, installed and developed a wide spread of laboratory facilities and encouraged the efforts of our own Research & Development Group. This would be considered normal for a producer, used to be relatively unusual but is now almost unique for a service company in our industrial sector. Their efforts over the years have led to the production of a significant and diverse portfolio of our own proprietary technologies in low-pressure oxo alcohols, ester hydrogenation, polymer condensation, fiber spinning and production, plasma arc furnace design, flue gas desulphurization and many others. They have proved to be a most valuable contributor to know-how and licensing sales, giving us a further advantage in our all-too-competitive marketplace.

Conditions Change

Now, all of this was fine in the 1950s, 1960s and early 1970s while we had low inflation, stable growth and therefore all the ingredients for secure investment. Capital projects proliferated, suppliers prospered and contractors flourished. But during most of the 1970s and early 1980s we began to live with the very opposite, unstable conditions when the instability of the economy matched the instability of the economists. Initially, the first oil price hikes created the apparent need for megabuck synthetic energy projects alongside the massive infrastructual developments in the Middle East and the demand for project and technology engineering services appeared to be enormous.

I still remember sitting in the reception area in Florham Park one day in the late 1970s reading a brochure indicating that Exxon had estimated a need for up to 160,000 fresh graduates over the following decade. They and we got it wrong.

The alternative energy technologies proved to be too inefficient and too capital-intensive and the world discovered a much cheaper, capital-free, high-efficiency variation — conservation. The multi-million-man-hour projects disappeared as fast as the West's control of oil prices. The effect on the producers was severe. The effect on the contracting industry was traumatic as higher inflation and expensive money led to severely constrained investment and a cutthroat marketplace where contractors desperate to stay in business were prepared to work for little more than salaries and burdens.

All of us, in whatever industry, strive to control our own destiny and we can do much to approach this ideal. But we cannot control inflation. Governments or their agents control inflation and in our own way we all do what we can to ensure that our respective governments never forget this fact. Some countries like Austria and Hungary maintain that they controlled inflation by exporting all their economists to the U.S.A. and Canada!

We are also learning to live with and compete with the continuing rise of Japan, and the effect of developing countries, particularly in the Far East, with their combination of ever-increasing efficiency and productivity tied to much lower costs of engineering and erection. Their influence and impact will not go away. Nothing could be more certain. Their thirst for knowledge is unquenchable and their approach to the market is immensely challenging.

View of Changes

As contractors we have witnessed the changes that surplus capacity and inflation have wrought in potential clients, the producers. They have all become masters of the de-bottleneck, or the art of getting a quart out of a pint pot. But also in a concerted effort more deliberately to control their destiny, producers, particularly the

the chemical and pharmaceutical majors, have begun to maximize their profit from each technology by extending their involvement and control from feedstock to final packaged product. This inevitably has led toward specialization in fewer product areas, and the related need to control more and more of the market volume. Risk has been subordinated to control — the control of the market — and, as a consequence of that control dependence, the hurdle rate for new technology has been raised. This reduction in new product competition or diversification is proving to be anathema to the licensing of new technology.

As a consequence we, as a contractor, have seen our technology portfolio from imported licenses stay static and even decline in quality. Modern technology has not automatically been available for transfer and license. This has had the consequential market effect of alternative processes being created, but remember the old adage from Emerson, or was it Elbert Hubbard, who said, "If a man write a better book, preach a better sermon or make a better mousetrap than his neighbor, tho' he build his house in the woods, the world will make a beaten path to his door."

Perhaps this society's paraphrase might be "if you build a better mousetrap the world will beat you out of the patent."

Indeed, quite recently my company has been involved in the licensing and transfer of two high-added-value technologies from a COMECON country to a Third-World country. This was simply the direct result of leading technology not being made available from the capitalist West. Some cry foul. Some argue that the quality of the product is not the same. But our clients clearly don't believe that. In any event, once selected, it is our role as contractors to implement our client's decision, and make sure it works.

Fortunately, this is not always the case, as the current discussions with the Winnipeg Rhesus Institute here in Canada demonstrate, whereby we are obtaining an exclusive license agreement from the Institute to enable us to offer turnkey blood plasma fractionation technology to the People's Republic of China.

Distinguishing Feature

Nevertheless, the net effect on the contractor of all these debits — the lack of investment, the retrofit, the scourge of inflation, the competition from developing countries, the decline in the quality of technology available for license — has been a crumbling of our profit base. My own company has seen its staff reduced from 20,000 to 10,000 in a period of seven years. But, looking at the annual results of our competitors, I believe we are one of the stronger survivors. It has forced an urgent and necessary reappraisal of our strengths and our weaknesses. We can no longer rely on manhours to live. Me-too manhours today are seldom profitable and we cannot rely solely on imported licenses. We have therefore set out selectively to develop further our technology portfolio, but in particular, to expand the contribution of our own Research & Development Division and their technological successes to our bottom-line profit base.

Any contractor can have a group of people who have all been trained in the relevant disciplines and, by and large, one would imagine that, given equivalent leadership, we would all be the same. Davy, of course, prefers to believe that we have a superior cadre of management people who are able to do better or be better than our competitors. But the truth of the matter is that the one element that can distinguish us from all our competitors is that body of knowledge and the intellectual property that is developed through our own research and development and in our engineering groups, which transcends the individuals themselves and represents the source of excellence for the corporation. We are nothing but the embodiment of our proprietary technology. It is our lifeblood. It is our source of salvation.

Perhaps earlier than most, we recognized that as the process industry and infrastructural capital construction programs shrank we were looking at the same number of companies competing for a much smaller pie. We began to involve our research and development groups much more in our commercial activities and we began to support our research and development people in a more substantial manner. In many cases, the large company research-and-development mentality has been, and perhaps could still be, for the directors of the research establishment, and the commercial people as well, to declare the importance of doing the last experiment first. But not only do they not do the last experiment first, they seldom ever get around to doing the last experiment at all. We could never afford such a luxury. Our direction is, and has been, to do the last experiment, to do it first, and then to cast it in steel and concrete.

Our development group has been prolific and commercially successful in its output. Its activities are carried out by a group of less than 100 people, but it has been responsible for licensing revenue of over $100 million in the last 10 years — small beer by world standards but very impactful to Davy. Its return on capital employed and return on company employee is far higher than that of our general contracting services. The intellectual property it has developed is the cornerstone for our whole business now and in the future, yet we do not undertake any fundamental research. Nor can we afford to throw money at "blue skies." Only large producers or governments can afford such luxuries! What we do possess is a group of people whose imagination, balanced by practical ability, enables them to convert concepts, discoveries, ideas, to a reality. This is a skill in its own right and its successful application allows us to minimize the corporate exposure and the lead time between concept and commercialization. And, of course, as we are not yet a producer, it allows us the freedom to access others' concepts. We are by no means incestuous in our approach.

R&D Budget

Our budget for our principal U.K. and German research and development groups is little more than 1% of turnover — distinctly mean when compared with the 5-6% that tends to apply to say the pharmaceutical majors or even compared with the reported figures last year of 2.7% of GNP for the U.S.A. and 2.2% for the U.K. But, perhaps more pointedly, that budget is equivalent today to more than 30% of our pre-tax profit. Regrettably, the commercial pressures of our particular marketplace, despite the successes we have enjoyed, still inhibit us from increasing that expenditure, but we do continue to maintain dedicated, loyal and talented teams of individuals in the U.K., Germany and the U.S.A. and give them every possible encouragement. More recently, however, in order to focus more attention on the research and development program and hopefully increase its scale and success ratio, we have raised its status within the corporate structure by creating a Research & Development Board, and re-stating its charter "to protect and enhance the technical future of the Davy group of companies by the renewal and growth of technologies appropriate to its needs." The Board is chaired by a Davy Corporation Director and its membership comprises the executives responsible for the research and development establishments together with key executives from our major operating companies in the iron and steel, metals and minerals and petroleum and chemicals sectors. The Davy Corporation Chief Executive is also a member of that board. Hopefully, it is one of those situations where the phrase, "I am from Head Office, I am here to help you," is more supportive than in the usual interpretation! In truth, I believe this to be one of the key precepts to our own success and constitutes one of the most important criteria for general success — if the Executive Board of the Company and, in particular, its Chief Executive, give demonstrable and positive support to the technology and licensing ethic, then success is possible. If they do not, then the company environment is not conducive and success will be derived with the greatest of difficulty.

Until recently we were fortunate in being able generally to license and commercialize our technology directly from bench-scale operation with pilot-plant support from partners or others as necessary. But our experience and a more demanding marketplace has led to the need to install more of our own pilot-plant facilities to produce samples for market testing and development. We have therefore added significantly to our multi-purpose pilot facilities so as to maximize and demonstrate the value of our downstream licenses.

Critical Factors

This corporate philosophy underwrites our commitment to research and development and the ever-growing belief in intellectual property being our salvation. But we need faith that our commitment is right and in this respect I was much taken by an extract from a recent presentation by Bob Malpas, a Managing Director of British Petroleum. In addressing the subject of chemical engineering and the contribution of research, he said: "The edges that research and technology can give our businesses are much more clearly understood than they were three or four years ago, when people were fighting for their lives in the petroleum refining and petrochemical business. Now they are recognizing once again that research and technology will give them edges: edges in products, edges in processes they need to succeed. Two things have happened: everybody has realized that we are in an age of unprecedented technological change and we are in an age of moderate to low growth. And when you have those two things together you can't just go and do a lot of copying. there is tremendous demand for better products . . . Everything is about quality in one form or another."

But despite our conviction and faith that our philosophy is right there are still a number of critical contributory factors to be taken into account:

— The lead times between winning engineering contracts and creating a successful development can be a factor of 10 times in duration. This creates emotional and cash-flow hurdles that can be difficult for a service company to accept.

— We need the patience to sit out the return on new investment. Patience may be the key to paradise, but it doesn't satisfy shareholders. Edison, and who better, was right when he said genius was 1% inspiration and 99% perspiration. There is also the law of diminishing hurdles. If you need to overcome, bypass or destroy N hurdles before success, then when they are so removed there will still be $(N-1)$ different hurdles. Maybe the Earl of Lytton had the best summary view, "genius does what it must, talent does what it can."

We need luck. We are great believers in luck but also creating luck through dedication and hard work. We try to employ good, talented people to improve our luck with management directed to seeing that those people have a stimulating work environment, get the tools and resources to do their job and ensure that is is not made difficult for them to succeed.

— We need a commercial partner to practice our inventions. For inventions, unfortunately, do not necessarily sell themselves. Nor is it all fun and fair dealing out there in the marketplace. There are sometimes more who are interested in preventing step-change improvements than there are in promoting them. It is vitally important, therefore, to choose and retain a commercial partner who understands the market, the players, the prevailing economics and who has the same ultimate goal — the desire to effect change, recognizing, as I mentioned earlier, that change can create enemies. That partner must also have the faith and resilience to live through the inevitable humps and bumps that characterize any technology verification program and any emerging or even established market.

Tripartite Cooperation

We also need to advertise our new inventions, but, like all new brooms, we have to be careful that our future broom factory is built on firm foundations. The cornerstones to this guarantee are lead time and patent coverage. But a dexterous use of time is essential. It is important that when patents are eventually published the new technology is ready to be commercialized. But the lead time itself is not the answer to competition. Putting steel and concrete in the ground and generating specification product is the real answer.

An interesting example that relates to these criteria is that covering our Low-Pressure Oxo Alcohol technology where three companies eventually came together to form a winning combination:

In 1969, a U.K. precious metals company, Johnson Matthey, brought to Davy a concept developed by a U.K. professor, Sir Geoffrey Wilkinson, for the improved production of oxo alcohols using rhodium catalysis. We had been approached due to our R&D abilities and our general background in synthesis gas chemistry. Successful mutual efforts led to early patent applications, only for us to find potential infringement of similar applications in the name of Union Carbide Corporation.

Fortunately, after several rounds of detailed negotiations, a tripartite cooperation of interests was formalized in 1971 which is still in place to this day. That decision to cooperate rather than compete (or even litigate) was fundamental to the success story that we have all enjoyed, not that it was all plain sailing to start with.

At the time of the research and developmental work throughout the early 1970s, petrochemicals were in general oversupply and a recession was just about to impact with the 1973 oil price hikes. It was not until 1976 that the first plant went into production at the Union Carbide facilities in Puerto Rico. We needed all that patience and commercial partner support as I referred to earlier, and an abundance of faith that our continuing expenditure on a step-change improvement would eventually bear fruit.

Since then, acting as the licensor, we have built 14 oxo plants throughout the world using our improved rhodium technology. We have successfully licensed and erected plants in eight countries, each having different licensing and erection requirements.

Despite our market lead we have continued to improve the technology in order to maintain that economic advantage — again an important element of our continuing near-monopoly.

Indeed, even 17 years after our first patent application we have recently signed a new, large-capacity oxo alcohols license in Taiwan. We believe this is a very solid example of our commitment to a strategy of technology development and bottom-line benefit.

We have also improved other critical areas of the process to the extent that in terms of yield, pressure, temperature of operation and catalyst cost, any competition will find it difficult, if not impossible, to surpass our economics. But more importantly, the chemistry we have used to generate these improvements has been used to develop new routes to other higher added-value chemicals.

Competition

This LP Oxo example is clearly an outstanding success, but my perhaps somewhat curt dismissal of the competition is not in any sense to imply complacency. As in any development we recognize that we cannot expect to avoid anything less than severe competition. We do not shrink from it, quite the reverse. Competition is the basis of the capitalist society. Yet, to compete effectively it is necessary to compete at the right level and with the proper tools. This means, as I have already stated, that we ourselves need to understand the market we intend to enter as well as the existing players. In other words, we need to think like a producer.

Without outside help this is the hardest imput to acquire, although a certain naivete is not that detrimental. But acquiring this producer mentality is vital, not only in choosing a commercial partner, but also in understanding the value of the technology we possess where license fees can amount to millions of dollars and typical royalties can be 1% to 5% of the product price. I am sure all of us know financial officers who appreciate the difference between 10 and 50% return on capital employed! And also those whose sole motivation seems to be to generate enough downside risks to take the subject proposal below the declared rejection thresholds.

We recognize that our partner has risks of his own. On the surface, as the investor, he has the ultimate risk. We do not forget that. It is our responsibility as the licensor to support his cause. So how do we balance these inputs and risks?

We like to believe in the equal profit, equal pain divide but this almost by definition is difficult to achieve. As an engineering contractor, we bring a vital ability to the total concept. We can take the project from inception to erection. We recognize the risk is primarily the capital investment and the return on that capital. Guarantees within the license agreement will protect against shortfall in yield or performance but that is not really the answer, providing only modest recovery against the assumed economic specification.

Performance against realistic targets is much more persuasive. I am pleased to say that we have not yet had to pay liabilities with respect to performance but we are far from complacent in this regard. We also endeavor to fix as many elements as possible to underwrite the capital exposure, and hence the economics and return on investment.

We might prefer to express and demonstrate our confidence in our new-found technologies by taking equity in the proposed commercial development, but here the low asset value of the normal engineering contractor, where people skills are his major, if not sole, asset, can be restrictive.

In our case, for example, our shareholders' equity is less than 10% of annual turnover and despite very favorable gearing, our ability, however encouraged, to take a substantial equity share is clearly limited. In truth, however, while we are more than willing to consider equity participation, we are much more likely to be inhibited by the recognition that we are contractors and not producers, and crossing that threshold to becoming a producer — some say from poacher to gamekeeper — would occupy considerable soul-searching time at Board level.

So those of you who are still following the argument will say, "But who runs the market price risk?" Let's not equivocate. This is the investor's liability. He is in the business to make money so he must be the expert in the business. Technology only allows him to play or enter the market. What I am implying is that you can't have investment without risk, but the converse is also true. Risk and reward are inexorably linked, both linearly and asymetrically. So the equal risk or pain to profit or reward approach drives the licensor to a fee, or more probably royalty, that reflects producer profitability but must also recognize the validity or proven nature of the technology, its impact in the marketplace from shutdown economics to profitable maturity and its potential period of application, all of which tend to generate interesting valuation discussions between licensor and investor!

Contract Important

Over and above trying to realize the value of the invention, it is important to comprehend that no matter how clever we may feel we are, we are nothing without a contract or a license agreement — that document wherein "the large print giveth but small print taketh away." Up to now, we have been able to strike deals that satisfied the licensor/licensee requirements. Perhaps that luck we work so hard for has played its part, but Sydney Smith was right in his assertion "that a great deal of talent continues to be lost to the world for want of but a little courage." With today's corporate culture of increasing bureaucracy and committee decision tending to inhibit and discourage the taking of risk perhaps a little more of the entrepreneurial push of Val Duncan of RTZ might help. One of his accredited maxims was, "if you can calculate a DCF it is too safe for us."

Notwithstanding that slightly quizzical conclusion, the overall driving force must be to minimize the dollars invested per ton of product. We therefore look (and it really is surprising how often we have derived success from setting such attainable objectives) we therefore look to achieve a low-pressure, low-temperature, cheap-materials-of-construction process. If fortune is with us, then we may get high yield also. Such objectives are relatively easy to set, but how do we achieve more successes? How do we know where to direct those precious dollars? We have no not-invented-here syndromes. We recognize the value of access to freedom of thought and outside assistance and here Davy has a most pertinent example in its developing butanediol technology:

In looking to extend the benefits and applications of our LP Oxo technology, our R&D people set up a research program to develop theprocess route to longer chain alcohols and diols for their improving solvent and detergent properties. To their delight, they were able to exploit the ester hydrogenation route which now characterizes the Davy maleic anhydride to butanediol, gammabutyrolactone and tetrahydrafuran derivatives process. So far so good. But how to commercialize? A detailed review of the market and its then prevailing economics confirmed that the current Reppe process for producing butanediol was high pressure, high temperature, modest yield and based on acetylene. The Davy process was low pressure, low temperature and high yield, based on maleic anhydride, but while this conversion was safer and more economic than the Reppe process, it was dependent on the availability of low-cost maleic anhydride. A full review of the maleic producers identified Standard Oil, or Sohio Chemicals as it now is, whose new fluidized-bed process for producing maleic from butane showed exciting partnership potential and further examination confirmed that the two processes were compatible and extremely energy-efficient, the Sohio process being exothermic and the Davy process endothermic.

Evolving Cases

Sohio was a well-established chemical producer whose clout and knowledge of the marketplace was vastly superior to that of Davy, but whose potential reward from selling maleic alone was thought to be less attractive than that evolving from the Sohio-Davy potential of going all the way from butane to butanediol, GBL and THF and on, to the engineering plastics and other specialty chemicals markets. Davy therefore sought out Sohio and now, many months on, both companies are deeply involved in technology and market economics verification and, as I mentioned earlier, those interesting valuation discussions which hopefully will enable Davy to license its derivatives process to Sohio.

I hope my message is becoming clearer, but please don't look for anything magical. There are no blinding flashes of inspiration in this text to brighten your day. Rather, the message that despite all-too-many failures or technological blind alleys, there are occasions where intelligent application and sound endeavor from dedicated teamwork can produce step-change technological achievement of durable and commercial quality. My company works hard at evolving such cases.

We believe that progress and eventual bottom-line success can only emerge from a constantly improving knowledge and appreciation of our future markets and the key players, competitors, producers and consumers and a degree of discipline and understanding in our application. We cannot ever cover the field and certainly cannot follow up every market stimulus but one of the fundamental facets of our corporate strategy is the well-forged link between marketing and R&D. We regularly input the marketing message from our various worldwide officers into our central R&D efforts. This is essential not only to keep abreast of change, but also for the inventors to appreciate the economic impact of their expenditure. This worldwide effort, its integration with theR&D group, the input from client tenders, enquiries and contracts, also valuable input, is a deliberate and conscious philosophy within our company. It is expensive, too, in overhead terms, but it all stems from the corporate ethic of pursuing technology and thereby having "something special" to sell. The interpretation of that marketing effort and its condensation into approved and funded action plans for the R&D group continues to be the cornerstone of our long-term growth and profitability.

Of course, there has to be the other side of the coin, namely, the ability to know at the earliest opportunity when to pull the proverbial plug — when to recognize the need to kill egos and save dollars. We try to minimize this happening by carefully controlled extension of our fields of research. No unnecessry risk from A to C. No blue skies. Rather, a logical progression from A to B and B to C. It's surprising how much the light of another candle increases the circumference of radiated light. And we don't fight chemistry. We don't force the chemistry to fit the supposed objective. We let the chemistry lead us to an invention. We try to let the laws of nature work for us downhill.

We learn to live with and understand failure. We have learned to build on success. Having accomplished the difficult part, the invention, it is vital to continue the development aspect of R&D to improve the technology and maintain or increase the market lead. An average patent life of 17 years is a long time to ignore, as is apparent from our Oxo technology.

In summary, we are simply realistic in the use of our intellects, all the way from the laboratory to the marketplace and back again. And we believe we are realistic enough to know the difference between an easy decision and a necessary but calculated gamble.

Key Conclusions

But what are the key conclusions that one can draw from this commercial?

To me there are two fundamental but related bases that must apply, particularly to the service company that is contemplating or practicing the generation and sale of technology:

1. The attitude at the top of the company is crucial. The Board and its Chief Executive must believe.

2. This attitude must be allied to a commercial culture in the company wherein the prospect of commercialization is continually apparent and continually encouraged.

Given those two bases, technology will survive.

Given the addition of that special talent and imagination so kindred to good R&D and licensing men, technology will flourish.

Given the extra dimensions of close communication with the marketeers, the players, the commercial realities and the ability to share progress with selected partners, then with faith, patience and luck, technology will prosper and its transfer to the bottom line will benefit the stockholders, and may even serve to encourage the accountants to have respect for we engineers after all.

Technology and its continuing growth is fundamental to wealth creation in company and in country. Thatcherite policies in Britain are at last rekindling our propensity for technology and revitalizing parts of our intellect, dormant for too long. We intend to market that intellect through licenses, wherever they may find a buyer.

It is good for our wealth. It is good for the wealth of our country, for wealth is not the exclusive property of the richer nation. All of us share the responsibility for spreading wealth, be it intellectual or monetary, and we must share the common objective of increasing the intellectual property and the wealth-creating opportunities available to our business sector. A success for any one of us is ultimately a success for all, not just in its transfer to individual bottom lines but in its overall stimulus to improve our intellectual property and raise the level of our achievement.

This society, with its worldwide influence and expertise will undoubtedly make an immense contribution to that achievement.