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## Fire Hose Technologies

Gerry Mortimer

*Technological University Dublin*, [gerard.mortimer@tudublin.ie](mailto:gerard.mortimer@tudublin.ie)

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**FIRE HOSE TECHNOLOGIES LTD.:  
A CASE STUDY IN NEW PRODUCT DEVELOPMENT<sup>1</sup>**

**Gerry Mortimer**

“Well, make up your mind, are you having a drink?” Noel Dillon<sup>2</sup> stayed slumped in the seat in the corner of the pub, oblivious of his brother-in-law Terry Joyce standing over him.

“I can’t,” said Noel eventually. “I have to drive back to the ferry.”

“Well one pint won’t kill you,” continued Terry.

“Neither will it be enough after this morning,” retorted Noel.

“Come on, cheer up,” said Terry, “it is not the end of the world.”

“It may not be the end of your world,” said Noel, “but it is pretty close to the end of mine.”

“Okay,” muttered Noel eventually, “I’ll have a pint of stout.”

“You’re not in Ireland now, you’re in the English midlands, although I suppose they all sell stout now,” replied Terry as he made his way to the bar. “It’s Beamish,” he said on his return, laying the two pints on the table. “Do you want any lunch?”

“No,” Noel snapped. And so, the directors of Fire Hose Technologies Ltd. found themselves sitting in a pub in a small midland town, sipping Beamish and reflecting on a morning which had begun so promisingly and had ended in disaster.

“What I can’t understand,” said Noel after a long silent interval, “is how it could all have turned so sour in three weeks. When I spoke to Grundy three weeks ago and made this appointment he

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<sup>1</sup> This case was developed as a basis for class discussion rather than to illustrate either effective or ineffective handling of an administrative situation.

<sup>2</sup> Names and other non-essential information have been disguised in the case.

specifically said 'sharpen your pencils and we will do a deal when you come over', and now this."

"Well he did tell us that the reason they were not going to go ahead with the order was the recent floods and the fact that the Borsetshire Fire Service had lost £2 million worth of equipment as a result," said Terry.

"But do you believe him?" asked Noel. "After all, we have invested all our efforts in getting an order from Borsetshire. They have had the product on trial for six months now. It is a week from Christmas and we will be heading into 1995 shortly with no orders and limited contacts."

"Well," said Terry, "I'm not prepared to give up so let's review the position to date and start making some decisions pretty fast."

#### THE IDEA

Noel Dillon had lived all his life in a small rural town in the south east of Ireland. He was in his early thirties and had spent most of his working life driving heavy vehicles. He had had a business hauling sand and aggregate which had closed when the local quarry had ceased to operate. He had then secured a contract for refuse collection from the local council and had operated three vehicles covering a large part of the country. The contract had been withdrawn in controversial circumstances and was the subject of possible litigation in 1994.

For several years, Noel had also worked as a part-time or retained firefighter in the local fire service. In most rural areas in Ireland the fire service was staffed on a part-time basis with normally eight firefighters retained. They were paid an annual fee and were also paid for each call out. In many cases there was a family tradition of working in the fire service and, in fact, Noel's father had been the local station officer. The local brigade operated from a small building which housed the vehicle and equipment and a meeting room/office.

It was as a result of working with the fire service that Noel developed the idea for a new product. All fire tenders carried hoses. Normally vehicles carried two types of hose. On either side of the vehicle was mounted a drum on which was coiled a small diameter rubber hose which was known as the first aid reel hose. It was

so called because it was usually the first hose used at an incident. It used an on-board water supply which would last up to 20 minutes and could be brought into action quickly. However, its effectiveness was limited. Each vehicle also carried up to 30 lengths of larger diameter hose. When laid flat this hose normally measured 4 inches in width. This hose had two purposes. It drew water from the nearest source of supply to the pump at the rear of the vehicle. It also carried water from the pump to the source of the fire. Most hoses were used to link the water supply to the pump. In urban areas this was normally a nearby hydrant. In rural areas it could be a lake or river. The hose was stored on the vehicle in rolls with a coupling at either end. On reaching an incident, the rolls of hose were removed from the vehicle, laid out on the ground and coupled together linking the water supply, vehicle pump and fire. The vehicle pump was driven by a PTO shaft operated by the vehicle's engine.

When the incident was over, firefighters would decouple the hose and taking one end in their hands would roll the hose along the ground and then replace the hose on the vehicle. Frequently the hose was dirty as a result of its contact with the ground and it would have to be laid out again at the station and washed. While unrolling the hose was, and was designed to be, fast and easily done, hose rolling was a difficult manual exercise involving the firefighter bending over while walking the length of the hose. When a hose had to be washed at the station the same operation had to be repeated. When rolled, one coupling was normally left in the centre of the roll and one on the outside of the roll. Some services used a form of rolling called Dutch rolling. In this case the rolling started from the mid point of the hose and, as a result, both couplings finished up on the outside of the hose. This form of rolling meant that two firefighters could each take hold of a coupling and move quickly to where the coupling was required. On the other hand it was more difficult for one firefighter to bring a Dutch rolled hose into use. In passing, it should be noted that back injuries were a major cause of lost man-days and claims for compensation in all fire services. At the very least, manually winding hoses while walking in a stooped position was likely to contribute to the problem. Normally when hoses were rolled at

the fireground, the firefighter was wearing full kit. It was a very unpopular job for firefighters.

Noel had always been interested in developing new ideas and with more time on his hands after the closure of the contracting business he began to apply himself to the task of developing a product which would take the manual effort out of hose winding. In doing so, he realised that fire services were inherently conservative about adopting new products and with good reason. Operational methods were drilled into firefighters so that they would react automatically to situations. While a product that rolled hoses would not be central to firefighting it would have to be of demonstrable benefit before a service would consider purchasing it.

Noel began by developing prototypes in his workshop. When he needed specialist engineering skills he enlisted the help of his brother-in-law Terry Joyce. Terry was general manager of a plastics manufacturing company which had an engineering workshop where Noel, with the assistance of the maintenance staff at the plant, was able to further develop the product. Terry became more and more involved in the project and they eventually agreed to jointly develop the product and so set up a company, Fire Hose Technologies Ltd, in which they had equal shares.

### THE PRODUCT

In the first instance, Noel set out to develop a product which would wind large diameter hoses. Over a two-year period, the product went through several major design changes and was added to with the development of a series of related products. The hose winder which finally emerged from the research bore little relationship to the original concept, though the principles remained the same.

In essence, the product consisted of a shaft, two bearings and two wheels. The bearings were fitted to a shelf in a locker on the vehicle. This was normally done under the shelf to avoid using valuable locker space. A stainless steel shaft was then inserted into the bearings. When not in use the shaft was recessed under the shelf. When required for use the locker was opened and the shaft pulled out so that it protruded about 6 inches outside the

vehicle. Two cast alloy wheels of 20 inches diameter were then fitted onto the shaft and slotted in position leaving a distance between the wheels slightly wider than the width of a flat hose. The winder was now ready to receive the hose. To wind the hose, the firefighter simply lifted the coupling at the end of the hose, placed the lugs of the coupling on a fitting on each wheel, set off centre, and wound the hose by turning a handle on the outer wheel. A standard hose took 35 seconds to wind. When wound, the outer wheel was removed and the hose pulled from the shaft. The outer wheel was then replaced ready to wind the next hose. Apart from being quick and convenient to operate, the wound hose was much tighter than with manual rolling. This offered two possible advantages. Firstly, it occupied less locker space which is regarded by fire services as a valuable commodity as normally all shelf space on a vehicle is used. Secondly, it was less likely to unravel from the centre when lifted to put into use. If a hose unravelled when required it was immediately discarded until the incident was over. When all the hoses were wound, the wheels were removed from the shaft and stored on a locker wall. The shaft was again recessed under the shelf. A major factor in the technical success of the product was that the winding commenced from an off centre position thus creating a circular roll. If the winding commenced from the centre of the wheels, an ellipse would be created which would obviously not be suitable for rolling out the hose.

The winder could be fitted to either side of the vehicle though it was generally fitted to the offside near the rear of the vehicle. A patent had been registered and was eventually taken out for Ireland and the UK. The Irish fire service was closely modelled on the UK service. From what Noel and Terry understood, other fire services did not roll hoses, rather they folded them in lengths. A further factor in limiting the patent was cost. A patent covering Ireland and the UK cost under £2,000. A patent for the EU would cost £20,000 and a world wide patent up to £100,000.

### THE SECOND PRODUCT

While still working on the first product Noel and Terry began to develop ideas for a further product. As previously noted, washing of hoses was also a tedious manual operation. The hose was laid

out on the ground and scrubbed with a brush. It was then turned over and the other side was washed. Noel began experimenting with ways of washing the hose while it was being wound. From this research the hose washer came into being. The hose washer relied on the fact that each fire tender had a pump and a water supply. As noted already, the water supply was connected to the first aid reel hose. The hose washer, again made from stainless steel, was fitted on a bottom shelf of the vehicle beside the first aid reel hose drum. It consisted of a steel pipe about one foot in length at one end of which was a rectangular fitting. On either side of the fitting were jets which released water in a predetermined flow and angle. The washer was positioned directly under the winder when in use. The rectangular fitting also contained two brushes which cleaned surface grit from the hose prior to washing and two rubber fittings which removed excess water from the hose after washing. The other end of the washer was connected to the water supply on the vehicle by diverting it from the first aid reel hose washer. When required, a simple turn of a tap diverted the water into the washer. In addition, an inductor was fitted which introduced detergent into the washer. The power of the pump on the vehicle lifted detergent from a container at a predetermined rate and mixed it with the water. Detergent suitable for cold water usage was readily available.

To operate it, the hose winder was set up as normal, the vehicle pump was set at a pressure of between 20 and 25 bar, a tap on the washer was switched to on and the hose was fed through the washer while being wound. The jets on the washer then cleaned the hose on both sides. The angle of the jets were set to reflect the angle of the hose as it was lifted from the ground behind the tender. While the winder could function independently of the washer, the washer needed the operation of the winder to work satisfactorily.

### THE THIRD PRODUCT

Noel then added a further product to the range. Using the fact that he now had a pressurised and effective supply of water and detergent he modified a lance similar to those seen in car washes and fitted 30 feet of rubber hose to it. The other end of the hose

was then fitted to the outlet used by the hose washer. This enabled other items to be washed. In particular, the vehicle could be washed down effectively. It was also possible to hose down a fire-fighter after an incident. Noel himself had used the lance in an incident where an ebbing tide had left a deposit of oil on a slipway rendering it very dangerous. The lance, again using the pump to supply pressure, had dispersed the oil effectively. Interest had also been expressed in using the product to decontaminate men and equipment after a fire involving chemicals. The alternative to this product was a power washer which would cost up to 10 times the price of the lance washer and which could only normally be used at base as it required an electricity supply.

### AND THEN THERE WERE FOUR PRODUCTS

When the first three products were demonstrated, interest was expressed in the possibility of developing a further product which could wash the two first aid reel hoses carried by a vehicle. Unlike the large hoses, the first hose was rigid and did not lie flat when not in use. It was made from rubber and had a diameter of less than 2 inches. It was used frequently and was very awkward to clean manually. Noel and Terry examined various options and developed further prototypes before eventually being satisfied with the outcome. The result was a cylinder almost one foot long and six inches in diameter. The cylinder was placed on the ground adjacent to the vehicle. A hose was fitted to the cylinder at one end and the hose washer outlet on the vehicle at the other end. A door was cut the full length of the cylinder. When this was removed, the first aid reel hose was placed into the cylinder and the door was replaced. Four jets inside the cylinder were positioned to wash the hose under significant pressure. Two guide rollers at either end of the cylinder facilitated the movement of the hose. The hose was wound onto the drum as normal except that it passed through the cylinder and was cleaned.

This completed the product range which now included:

- Hose Winder
- Hose Washer
- Power Washer

- First Aid Hose Washer.

No further additions were envisaged. Most of the fabrication was subcontracted to a local engineering company though some assembly was undertaken directly in-house. Having examined the costs involved and after discussions with interested customers, prices were set as follows:

- A complete system fitted to one side of the vehicle was £1,500.
- The winder was priced at £500.
- The winder and washer was £1,000.
- The power washer was priced at £200.
- The first aid hose washer was priced at £300.

In the case of options 4 and 5 it is assumed that the hose washer has been purchased. Otherwise extra costs could be incurred.

The products were priced to provide for a breakdown point of 60-70 complete units or £100,000 in annual turnover, though it was obviously hoped to exceed this. Noel and Terry recognised that while the price was not considered excessive by potential customers, some had commented that it was difficult to see the price in the fittings. This arose because volume for each component was likely to be low and so the cost of each component was substantial.

#### THE MARKET

The market was assumed to be Ireland and the UK. Fire services in both countries were in close contact and operated largely similar procedures. The products did not appear to have application in the remainder of continental Europe or the USA though this remained to be investigated thoroughly. It was estimated that there were approximately 500 water carrying fire tenders in Ireland and up to 8,000 in the UK. Each fire service in both countries was based on a local authority area such as a city or county. In Ireland there were some 30 such authorities while in the UK, where the authorities covered larger population and areas, there were some 60 authorities of which the biggest was London. Borsetshire was

the second largest, serving a population of more than 2 million. The services in both countries operated independently of central control though they were subject to regular inspection and budgetary constraints. Each fire service was under the management of a chief fire officer (CFO). In Ireland, chief fire officers being newly appointed were expected to have a formal engineering qualification and were likely to have come into the position from another branch of the public service. On the other hand, all CFOs in the UK had come through the ranks of firefighters. The CFO was, in the first instance, responsible to the local authority. Each fire service had a budget for equipment, though in Ireland the allocation of resources for purchasing a new vehicle was decided at central government level.

Vehicle replacement policy depended largely on the local situation and, in particular, on usage. UK fire services appeared to have more resources than Irish services. The following replacement policy was typical. A vehicle might have a front line life of 8 years. After this period it would be relocated and used as back up or for training for a further 5 to 8 years. It was then scrapped. In passing it should be noted that the Fire Hose Technology system could be readily fitted to a new or existing vehicle.

While local fire services would be the main potential customers, there were some other users, principally airports and major industrial installations.

The system was clearly not a major purchase by fire services but it was a new product and would be likely to be assessed as such. Early orders were likely to be of a trial nature. The balance of benefits from the product between fire service and firefighter could dictate whether a service would purchase the product. Noel and Terry realised that fire services were only likely to purchase if they saw a clearly defined benefit and any repeat purchases would depend on the system being used in practice.

While services were independent, they maintained relatively close contact with each other and so product news would be likely to travel relatively quickly. There was also some evidence that some fire services were more innovative than others but it was difficult to establish this. They were not necessarily the biggest services.

Fire service management was relatively easily identified though it was much more difficult to establish clear roles on the purchase of a new product. In addition titles varied from service to service. The Borsetshire example may or may not have been typical and in any event took several visits by Noel and Terry to establish.

- Chief Fire Officer Phil Archer was in overall command of the brigade. His role appeared to be largely a policy-making role with little involvement in day-to-day operations. However, in this instance, he had been a useful first contact and had attended the first demonstration at brigade H.Q. Thereafter he had no role in the process.
- Deputy CFO Tom Forrest appeared to be responsible for operations. He appeared to have a major influence in the purchasing process for a new product, though he also remained in the background after the initial demonstration.
- Operations Officer Joe Grundy was the main contact. His principal role appeared to be responsibility for manpower. He attended all meetings and demonstrations.
- Brigade Engineer Sid Perks had nominal responsibility for all technical purchases but indicated to Noel and Terry that he would not have a significant influence in the decision process.
- Purchasing Officer Brian Aldridge appeared to only be concerned with routine purchases.
- Station Officer Paul Carter was in charge of the headquarters fire station. His official role seemed to be minimal but he appeared to Noel and Terry to be quite influential and was well disposed towards the product.

In Ireland, as the services were smaller, management frequently rested with at most two or three senior personnel. The CFO again dealt with policy while the assistant CFO took charge of operations. However, from what Noel and Terry had seen, not much happened without the involvement at some stage of the CFO.

UK fire services appeared to mostly deal directly with manufacturers with few intermediaries involved. In Ireland, on the

other hand, the market was much smaller and most items were imported. As a result, most sales tended to be through distributors, many of whom served other markets such as fire extinguishers, first aid and fire prevention equipment. The market was dominated by two or three large players, though the general equipment market for small ticket items such as fire extinguishers was very scattered and was characterised by easy entry. Noel and Terry had developed a close relationship with one of the major distributors who had been very helpful. But in view of the relatively easy access to the market Noel and Terry wondered whether it made sense to enter into a distribution arrangement.

Promotion was mostly through attendance at trade fairs. There was one major exhibition each year in the UK which also tended to attract Irish fire service management. However, apart from the cost of exhibiting, which would run to several thousand pounds, display was also a problem as a proper demonstration needed a fire tender and much open space. In Ireland the two principal annual events were the Chief Fire Officers Conference in May and the Fire Engineers conference in October, which was attended by ranks below that of CFO. Both conferences had small trade shows attached which were available at a relatively low cost. The conferences rotated around the country and were normally organised by the local fire service. Both conferences attracted a considerable number of delegates from the UK who appeared to greatly enjoy Irish hospitality.

There was one specialist monthly magazine called *Fire* which serviced the industry in the UK and was also circulated in Ireland.

With regard to vehicle manufacturing there were three major UK manufacturers and one in Ireland. These fulfilled orders to the exact specification of the fire service purchasing the vehicle.

#### THE COMMERCIALISATION PROCESS

The product was first brought to public attention in May of 1993 when Noel and Terry attended the CFO Conference in Bantry, Co. Cork. A prototype winder was demonstrated and attracted considerable interest in particular from UK CFOs, one of whom was the Borsetshire CFO. In all about six UK CFOs expressed interest

in obtaining further information, though it was made clear to them that much work remained to be done. In general the reaction was very heartening. Noel spent the rest of 1993 refining the winder and developing the washer. It was a long, tedious process with many false starts. Early in 1994, the product was demonstrated on an edition of the popular TV chat show, "The Late Late Show". Once a year the programme was dedicated to enterprise development. A fire tender was borrowed for the day and was drawn up outside the studio with much hooting of sirens. In total the product received over a minute of airtime on a prime time show. Even after this showing, further major revisions were undertaken. By April of 1994 the first three products were ready. A few systems were sold locally but the major thrust was to start developing the UK market. Contact was renewed with the CFO of Borsetshire, a major UK midland fire service. They were targeted for their size, interest and ease of access by car ferry when transporting goods. A demonstration was organised which was attended by all senior management at brigade HQ. As a result, a complete system was fitted, excluding the first aid reel hose washer which had not been developed by then. Following discussions with Borsetshire, the system was sold for £1,000. Borsetshire preferred to purchase rather than simply have a trial as it placed them in more control and Noel was glad of the money, little as it was, because development costs were mounting. Research and development assistance had been provided by the local development agency but Noel's resources were now limited as indeed were Terry's. Terry also realised that he could only devote limited time to the project though he visited Borsetshire on three or four occasions with Noel.

The arrangement with Borsetshire was that the system would be fitted to a fire tender operating in a busy urban area. Noel fitted the system and visited Borsetshire about every two months, partly to check on progress and also for discussions with Grundy and others on the first aid reel hose washer which was, by then, being developed. The arrangement with Borsetshire was that they would log usage and comments over a trial period which could run from three to six months. At a visit after two months the brigade engineer confided to Noel and Terry that if the trial was satisfac-

tory, the brigade would purchase between 50 and 70 full units for use in major full-time stations. Visits to the station where the system was fitted indicated that the firefighters were pleased with the system and, most importantly, were using it. However, Noel was obliged to show them, on a few occasions, how to get full use from the system and he realised that he would have to prepare a users manual.

While the trial was in process, Noel and Terry took a decision that they would not make any further contacts in the UK until the trial was complete. They felt that any other service would ask who else had purchased the product and on being told that the product was on trial in Borsetshire would await the results of the trial. However, in October of 1994, Noel again demonstrated the product at the Fire Engineers Conference in Cork. Again there was some interest among UK visitors and a few new contacts were made. The product had also been shown but not demonstrated at the equivalent conference in 1993 but attracted no interest. A demonstration seemed to be an essential marketing tool.

The trial in Borsetshire continued in fact for six months until November. Noel again spoke to Grundy who was now the main contact. Grundy arranged an appointment for Noel and Terry and, as indicated at the start of this case, gave Noel to understand that he was ready to do a deal on a multiple purchase. They had always found Grundy awkward and extremely abrasive, though he appeared to be popular and well known to firefighters in the stations which Noel and Terry visited and he had also taken a proprietorial interest in the product. For the visit in mid-December Noel and Terry had brought the final version of the first aid reel hose washer. In order to demonstrate this, they needed to use the tender on which the system had been fitted. To their surprise, the tender had been moved a few weeks previously to a quieter station. The firefighters at that station had no idea of what the system was for and had not used it. But worse was to follow. Noel and Terry knew that there had been severe and highly localised flooding in Borsetshire the previous weekend. Several lives had been lost and the fire service had been severely stretched. Grundy claimed that the service had lost up to £2 million in damaged, ruined or lost equipment. For this reason, he told Noel and Terry



they would not be purchasing any of the hose systems. His parting remarks were: "I have no money to spend on toys" and "Can this be dismantled — the guys where it was have become fond of it and want it back".

His attitude appeared to have changed completely and the meeting was over in less than 30 minutes.

#### WHAT NEXT?

The pints of stout were working their oracle and the pair began to calm down though they were still in a state of shock. Terry, with some experience of deals that failed to materialise, had not been as confident as Noel that a deal was assured. However, it was Noel, and not Terry, who had dealt with Grundy. With a long wait to the ferry, they began to take stock. They recognised that they would have to start selling quickly or the project was doomed. Their resources were limited and Terry would not be in a position to devote any time to the business after Christmas due to his other commitments. They knew that they required promotional literature but had delayed producing this until the full product range was ready. Now this was being overtaken by limited resources. Decisions were going to have to be taken quickly on several points.

- Should they continue to seek direct sales or use an agent or distributor in the UK with consequent implications for margin and price. Noel had no selling experience.
- Either way, how could or should they promote the product?
- Might some organisation be interested in licensing the product?

They also pondered what Grundy had said, unsure as to whether he meant it. How was the product really seen by fire services? Certainly all had different priorities and different product benefits seemed to appeal to different services. One, for example, had cited a study which they had carried out on leaks in hoses. This had shown that most leaks were caused by particles such as grit adhering to the hose. Then when the hose was rolled and stored on a moving vehicle, the abrasion caused further leaks. The Fire

Hose Technology system solved this problem, yet when this was mentioned to management from another service they showed no interest at all. A reassessment of product benefits also seemed to be essential but where should they start? There were still several hours before the ferry sailed.