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PURCHASING A FISCAL FLOW METERING STATION SUPPLIERS POINT OF VIEW

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SUPPLIERS POINT OF VIEW

1.0 INTRODUCTION

Today we will hear the views of the purchaser/operator; the Fiscal Authority and the Supplier on the purchase of a Fiscal Flow Metering Station. We will assume that the intention of all the groups is to provide metering systems to the highest quality with regard to flow metering, recognising that price can be an overriding consideration.

This paper will detail the major factors of concern to the supplier, consistent with meeting the common objective.

This will include the following major areas, (i) quotation (ii) specifications (iii) design/engineering (iv) purchasing (v) manufacture (vi) testing (vii) installation/commissioning/service (viii) quality assurance (ix) price/delivery (x) research and development (xi) documentation (xii) areas for improvement.

It should be noted that the experience of our company has been very good working on large fiscal metering systems for Norway and slides 1 to 5 show examples of the end product.

2.0 QUOTATION

2.1 The supplier is involved in the project generally when requested to quote and at that stage he would normally be presented with large volumes of the customers specifications. In some instances the converse is the case and a £ 5M job has been bid based on 2 pages of specification.

2.2 The suppliers prefer to be involved in projects prior to the presentation of bid documents. This may take the form of discussion of operating parameters, meter sizing and layout, or on a specific material problem. It is of assistance to the supplier, as he is then aware of the background to the request to bid and consequently can make a more intelligent presentation. In addition it would be an advantage to the customer since he can obtain helpful suggestions/calculations etc., while he is at the conceptual stage of designing his plant, based on the suppliers expertise.

2.3 Generally the customer wishes the quotation turned round in a very brief period. The supplier understands the need for urgency but he must make a judgement on how to respond based on some of the following restraints (a) the current work load of

those in the estimating section (b) the apparent complexity of the specification (c) the existing work load in the factory (d) the experience of the supplier with the particular customer, i.e. does the supplier get a fair share of the jobs he normally bids to that particular customer (e) knowledge of the specific job.

2.4 When deciding how to respond, it would be helpful, if the customer highlighted, in his request to bid documents, all the major deviations from international specifications, e.g. unusual material requirements, specific documentation or inspection needs, unusual equipment needs, etc. Reviewing specifications should not be similar to background reading for Mastermind where the competitors chosen subject is "Firm X's Specification Sections AA to Sections ZZ inclusive" with any passes, resulting in the supplier losing an order or costing the supplier many thousand pounds in the course of the project. Issuing specifications should not be a method of catching out unsuspecting suppliers but should be a method of accurately informing all the potential suppliers such that they can produce a precise, intelligent quote, on time

2.5 It should be borne in mind that all suppliers get a small percentage of the jobs for which they bid and

large metering stations involve the supplier in considerable expense which is never recovered if he is unsuccessful with his bid. This means that the supplier has to limit the time he spends reviewing specifications and the experienced estimator looks for exceptions to the norm.

2.6 Perhaps the customer should consider paying the suppliers who quote, but do not get the job. This would ensure improved quotations and would stop suppliers feeling that in some instances they are simply making up one of the three quotes required by the Purchasing Manager.

3.0 SPECIFICATIONS

These can be divided into four main headings:

(i) International Specifications

(ii) National Specifications

(iii) Fiscal Authority Requirements

(iv) Customers Specifications.

3.1 INTERNATIONAL SPECIFICATIONS

These generally present least problem to the experienced/reputable supplier. The specifications would generally cover such items as metering (e.g. ISO 5167 for Orifice Metering and API Chapter 4 for Crude Oil Metering); materials, valves, instruments, drawings, cables, safety,

quality assurance etc. Problems may arise if there is a recent revision of such a specification and in such a case it would be helpful if the customer drew attention to items he is aware of which have changed and specifies the Standard by revision number and date.

3.2 NATIONAL SPECIFICATIONS

In the U.K. these are the British Standards and the Institute of Petroleum Codes, and in Norway, the N.S. Standards apply. For companies operating in international markets it is essential that they are familiar with the National Standards in the country to which the equipment is to be supplied, but this takes time. It is helpful however, if the customer can highlight variations between their own National standards and the International ones. Daniel normally find that the Norwegian companies do a very good job in this respect. For example when N.S. 5801 was introduced, Statoil personnel spent considerable time and money to ensure that Daniel were aware of its implications.

To assist international trade the use of International Specifications is always to be preferred. It is unfortunate when the impression is created that National Specifications are being used by a country to legitimise a trade embargo.

3.3 FISCAL AUTHORITY REQUIREMENTS

In the case of flow metering stations for the North Sea we are normally considering one or a combination of the following, the Norwegian Petroleum Directorate (N.P.D.), the Direktoratet for Maleteknikk, and the Department of Energy (D. of E.) requirements all of which are different in certain aspects. We find the N.P.D. regulations the most comprehensive and most in keeping with International Standards on flow metering. As suppliers we appreciate the opportunity to comment on any revisions to these documents, it not only allows intelligent discussion but it also permits the supplier to prepare for any changes.

3.4 CUSTOMERS SPECIFICATIONS

These are generally the most controversial specifications and the ones most likely to lead to confusion. Obviously the customer has to prepare project specific specifications but it would be helpful if specifications for general equipment that have survived the test of time are not subject to continuous specification updating. From this point of view the specifications of the long standing oil companies have much to commend them. When a contract is awarded the customer

should not present the supplier with new revisions of his specification. If he does, he should expect to reimburse the supplier for the time involved reviewing the specification in addition to cost and time involved in implementing the changes.

4.0 DESIGN - ENGINEERING

4.1 This is the most critical aspect in the production of a quality fiscal metering station. If this work is not done precisely and accurately it may well be impossible to rectify the situation at a later stage, e.g. only a limited space may be made available on a platform. At this stage corrections can be made by use of Snowpake or a rubber, whereas by the time equipment is fabricated, burning torches and welding rods are necessary and this is an expensive route to rectification.

4.2 The following prerequisites are essential for the design of a fiscal metering station.

a) A clearly defined specification giving precise details of fluid to be metered and physical properties at operating condition.

b) Operating conditions - flow range, pressure, temperature (normal and extremes properly identified).

c) Standard Conditions for temperature and pressure.

d) Clear definition of any limitations on Station size and weight for both the skid and for the panel.

e) Interface with surrounding equipment e.g. (i) pump curves for flow control (ii) imposed stress from adjacent pipework (iii) telemetry requirements (iv) print out format etc.

f) Delivery requirements.

g) Drawings required (including standards) calculations etc.

h) Competent mechanical, electronic and software engineering group with experience in the design of large fiscal metering packages.

4.3 The design engineers should work with the client from the receipt of the order through to delivery and if necessary to site. As most of these systems are unique, the engineer must design precisely to the customers requirements. Realistically, the customer has not always precisely defined his needs prior to the award of contract and the good supplier should adapt to the customers needs as the project proceeds. This imposes certain restraints on both parties involved, namely (a) the customer must be prepared

to recognise the fact that changes are required to be paid for (b) the supplier must not regard change orders as opening Pandora's Box to increase profitability.

5.0 PURCHASING

5.1 As in the case in design engineering and in all the disciplines, Purchasing has to conform to the requirements of Quality Assurance Standard N.S.5801 and/or B.S. 5750 Part 1.

This ensures that the Purchasing Group use only approved suppliers and that there is a checking procedure so that the purchase request documents are checked and countersigned. The customers specifications are then assured of being adhered to, with regards to such items as materials, accuracy, non-destructive testing, certification, quality assurance, spares, documentation etc.

5.2 However, there is an increasing trend by the customer to give recommended suppliers. This is understandable, as the customer will get the identical equipment. ensuring uniformity on site with regards to spares, manuals, etc. System suppliers will assume that if the customer has recommended a supplier than it has been audited by the customer. In this instance our company would not carry out a quality audit.

The disadvantage of this route to the supplier is that he may be using a supplier whose equipment is not totally familiar.

6.0 MANUFACTURING

6.1 In order to manufacture a fiscal metering station the resources of (i) space (ii) machines and (iii) competent labour force must be available. It is also desirable that the manufacturing unit is sited in close proximity to all the other disciplines, e.g. purchasing and engineering to maximise communications.

6.2 The bulk of the manhours used on a metering system are generally expended in the manufacturing area. This means that the personnel must be adequately trained, work to clear work instructions/drawings, have proper tools for the job and be carefully supervised.

The personnel must carry appropriate qualifications, e.g. coded welders, qualified radiographers and N.D.T. personnel, etc.

6.3 In addition to producing a quality product, manufacturing are asked to work to very tight time schedules. This constant pressure is not always the customers fault (as most suppliers would maintain). It can be a combination of a number of factors many of which are under the suppliers

control. Such factors are (a) agreeing to a tight delivery since at the negotiation stage the Purchasing Manager has indicated that the competitors have promised a much better delivery. The customer asks for as tight a time schedule as possible in the hope that his actual required date can be maintained. This can lead to situation where the management push hard to meet an agreed date and the unit then lies around the factory for months. This can affect the attitude to the next order for that particular customer and the workforce may conclude that management have pushed them hard for no apparently good reason.

(b) the sub suppliers may state at the time of a budget request that a certain delivery can be achieved. Then when a formal order is placed with all the specifications attached, the delivery date dramatically extends. This can result in the manufacturing personnel having to make up for this lost time. This is a specific area where the suppliers experience can be useful.

(c) internal work loading in the plant can give the manufacturing unit a major problem. The sales department make a projection of forward loading but often order placements go back and orders which were confidently predicted do not materialise.

It makes it difficult for the supplier to plan the manpower requirements in advance in these circumstances. No company likes to have the reputation of a 'hire and fire' company, but in the case of manufacturing large systems, it has become necessary to try and maintain a good professional core and to use temporary labour to deal with peaks.

The oil/gas companies could assist the suppliers by giving as realistic forward projections of projects as is possible.

It is incumbent on the supplier to forward plan his work loading such that all the work undertaken will have the manpower available to meet the delivery dates promised.

Currently we have an ideal example in our plant where the oil company came early to us and placed an order for a duplicate of a large metering package. The oil company did not ask for a tight delivery schedule and consequently we are able to fit this order into the troughs which invariably ripple through from engineering, to purchasing, to manufacturing/quality control, to testing and then shipping.

Having had this help from the client the suppliers are under an increased obligation to produce quality products on time.

6.4 Manufacturing must continually look at mechanical aids to increase efficiency. There are always new machines and techniques flooding the market but in light to heavy mechanical engineering these machines are never inexpensive. A balanced judgement has to be made between high capital expenditure and reduced operating costs. This is never an easy decision with uncertain future orders and accountants continually examining short term profitability.

Automatic welding techniques, N.C. machines etc., are areas already giving valuable returns in a number of companies. Automatic techniques for termination, cabling etc., need to be examined.

6.5 The use of Computer Aided Manufacturing techniques for shop loading and machine control will make ever increasing impact in manufacturing premises in the future.

7.0 TESTING

7.1 One advantage in purchasing a metering system as a single unit is that it can be tried and tested before being installed. This gives a degree of confidence when the unit is installed, which would not be the case if individual items were purchased and put together in a field location. I am sure that there are a number of customers who will

highlight deficiencies which arose when systems were delivered to site. Whilst this could be extremely frustrating it substantiates the general argument for buying a tested system where all of a suppliers experts are available to solve any problems which are found. Think how much worse it would be if the system had not been tested; and the problem had to be resolved on site.

7.2 Items used on the systems such as valves, meters, instruments, transducers etc., should be tested at the sub-supplier before installing in to the metering system. This puts the responsibility for supplying tried and tested components onto the manufacture of the components.

7.3 When it comes to testing components and the system in the suppliers factory there can be differences in opinion as to the scope of these tests. The supplier must convince the customer that he is getting a system which will operate in accordance with the customers specification. It is not possible to provide 100% confidence in the system as the supplier cannot reproduce what will happen in operation, e.g. no gas available for gas flow test; no oil for testing; communications with other instruments/computers are limited, etc. etc. In addition, testing at the suppliers plant is not

an excuse for unlimited experimentation by the customer. This would only be possible if the details of the experiments were discussed at an early stage in the project and the delivery and cost implications were agreed upon. The supplier is under a great deal of pressure to get the equipment out in time and within budget and additional testing time means that these objectives cannot be met. The customer is not always aware of the pressure being applied internally to meet delivery even without expeditors etc., from the customer. Every day one of these large systems is late delays payment, and consequently the supplier has a lot of money paid out with little return until delivery is made.

The conclusion is 'Test by all means, but keep the tests as meaningful as possible over a defined period of time'. The extent of testing must be defined in a test schedule at the award of contract.

8.0 INSTALLATION; COMMISSIONING; SERVICE

8.1 There is little point in providing a well tried and tested system if it is installed poorly, and badly commissioned. What can be done to avoid such pitfalls? There is a wide spectrum of approaches, none of which seems to be ideal. These range from

the customer having a contractor buy and engineer the equipment and then hands it over to the operating group, who have never seen the unit but are expected to install and operate it. At the other extreme is the oil company which leaves everything to the supply company and expects the supplier to take all the responsibility for supervising installation and commissioning and thereafter servicing the unit.

In an ideal world, the oil company has an operating group which, co-ordinating with the supplier, would have the expertise and the time to engineer the new system exactly as they will require it. They would oversee the supplier, follow the installation, commissioning, and be being able to conduct their own ongoing servicing. This ideal, in Daniel experience, is seldom achieved since such a multi-disciplined team is not available, as it is extremely difficult to release operations personnel for front-end engineering work. Conversely most front-end engineers do not have the experience or the time for commissioning or servicing.

The suppliers supply back-up support for their systems, but there is a difficulty for the supplier in knowing what extent to retain manpower for this aspect of the work. There is a wide variety of

approaches which the customer can choose to take and this variety means there is no definition for the supplier in deciding manpower level. Our company offers a long term servicing contract. Many companies choose not to avail themselves of this. The buyer should not then expect the same level of instant back-up support as the company which has entered into a long term agreement - the supplier simply cannot afford to have manpower waiting for a telephone call which may never occur. The bigger the supplier, the easier it is to spare a qualified person for an urgent call, than it is for a small company.

The suppliers would like to have a situation where either the customer is capable of taking care of most contingencies which arises after the tested unit leaves the factory or (more realistically) the buyer and the supplier reach a long term agreement such that the supplier can have the personnel available to cope with any unforeseen problems.

9.0 QUALITY ASSURANCE

9.1 As one who has earned his living working in Quality Control/Quality Assurance for the last 18 years, my opinion is not exactly unbiased. I am totally committed to the pursuit of quality. The efforts

being made both sides of the North Sea to produce quality products seems to be a major step in the right direction particularly over the last five years. I refrained from saying a 'major step forward' since in Scotland at least, it seems to be simply trying to return to the situation prior to the last world war when 'Made in Scotland' was synonymous with a quality product.

9.2 It seems to me that the advent of B.S. 5750 Part 1 and N.S. 5801 has elevated the quality philosophy to its rightful position in our industrial thinking. The paper work associated with it can be a daunting prospect and in some instances overdone, but we must look at the positive side of quality assurance and accept minor irritants.

9.3 When I examine what I mean by quality, it seems to me that 'Fit for the purpose' is a useful guide and it disturbs me when Inspectors give Quality Assurance a bad name by dwelling on certain minutia of specifications without looking at the overall requirements. Unfortunately this approach gives Production and Accountants a bad impression of Quality personnel which can be counter productive in achieving the desired results.

9.4 To be controversial, it seems to me that the Norwegian approach to the introduction of Quality

Assurance has been much more effective than the U.K. approach. As an outsider I have the impression that in Norway the push on Quality has come from governmental level (as is the case in the U.K.) The Norwegians have then imposed this on the major oil companies who have in turn, passed the requirement onto the sub supplier. Thus pressure is made from the top right through to the several levels of industrial companies.

This results in reduced requirement for D.N.V or Lloyds inspection and we can state, that there is no deterioration in quality when there is no outside inspection.

In the U.K. the procedure has been to introduce a national accreditation scheme to B.S. 5750 which is administered primarily by Lloyds and B.S.I. Unfortunately this had just been introduced when the major oil companies introduced QUASCO requirements and consequently accreditation offers little attraction. Thus the opportunity to introduce a nationwide approach with teeth has been lost. This means that in the U.K., we have some jobs with third part inspection and others without.

10.0 PRICE AND DELIVERY

10.1 The price of a metering station should simply reflect the specification. As metering engineers

we are often surprised how parsimonious major companies can be to metering. This unit which can give so much information as well as being the cash register for the operation is treated to space and price cutting which is unbelievable. It is like running a beautifully designed and planned supermarket and asking those on the cash desk to work with an abacus. This can best be illustrated by examining an Orifice Gas Metering Station made to I.S.O 5167. The upstream and downstream lengths given in Table 3 are for minimum lengths. Does anybody design with longer lengths to give more confidence in the results? Not likely!! It is not just the purchaser who can be at fault in this instance. The supplier in his effort to win the order and to be as competitive as possible offers the minimum within the interpretation of the specification. This can only be overcome by the customer specifying or asking what he requires for accurate metering and paying a price accordingly.

10.2 Previously some suppliers had the reputation of being 'Mr. Extra'. The price was squeezed at purchase order stage and the supplier endeavoured to make their profit by calling everything an extra during the course of a job. Those days are gone! The specifications and contract details are now so

tight that it is virtually impossible for the sub-supplier to claim any extras unless there is a very genuine, documented change in the scope of the contract. In extreme cases the customer can use the contract in an attempt to obtain much that he is not going to pay for. Fortunately there are not too many of these people about.

10.3 A very tight time schedule is not conducive to efficient working in the suppliers unit, unless it is a repeat order. If the buyer can see no way to have a reasonable delivery time the supplier would prefer to be involved in discussion as soon as possible and some intent shown to permit long lead items to be bought.

10.4 What can be done to reduce price and improve the delivery of large metering stations? Apart from reducing all the specifications to a minimum which may lead to an inferior metering station our experience is that a repeat of a previously constructed station is the best technique to reduce time and cost. This is due to the fact that design and draughting can be minimised. The purchasing time can be greatly reduced and manufacturing time can be minimised since previous snags and problems can be avoided.

When a metering station is being considered by an

oil company they should approach reputable suppliers and ask if they had supplied a station to cover a similar set of conditions? The supplier could then supply sufficient information for the customer to decide if the package offered met their requirements. This approach would result in the customer involving the metering companies at an early stage but could well reduce the purchasers own engineering and purchasing time.

10.5 Other areas of price reduction are continually being sought. Different types of meters are being investigated which may not require the same length of upstream and downstream pipe lengths. The search for a small volume prover comparable in performance with a conventional prover continues. Alternative materials can be considered but currently it would appear that the alternatives would add to the delivery due to insufficient supply of such materials.

11. RESEARCH AND DEVELOPMENT

11.1 Should Research and Development into new products be the work of the supplier, the oil company or separate research organisations? As a general view all of these bodies are involved in research and development. This does not mean that they should

carry out their research and development in isolation.

11.2 As the oil and gas companies have the primary source of income and are much larger groups than the manufacturers and the smaller engineering shops, it is my opinion that they should be the prime motivators in research and development, as they have been in the initial development of the prover systems.

This does not mean that they should do the research by themselves but undertake joint ventures where they make the lion's share of the payment.

Why the oil companies? Apart from the financial situation I believe they have the facilities available to carry out the research. For example, only gas companies can undertake work of any great significance on natural gas and companies like British Gas and Gasunie have excellent facilities to undertake test work. Similarly there are few facilities available to test liquified gases and development work on these products would ideally be done jointly in the facilities run by the major oil and gas companies.

11.3 An alternative to this approach is to have large centralised government facilities, such as the National Engineering Laboratories or the National

Bureau of Standards, doing basic research with final field testing done as outlined above. Government facilities certainly play a vital role in initiating new ideas, in testing equipment and developing engineering fundamentals. They also play a vital role in encouraging joint ventures e.g. N.E.L. has undertaken a project to study the effect of edge variations on the orifice and a group of oil and gas companies and suppliers have combined to fund and advise in this work.

11.4 Of course the suppliers do much original work on their own. Where would Daniel be without the original inventive genius of Mr Daniel and his orifice fitting or the Waugh Prover without Mr Waugh's work. The liquid turbine meter, as generally used today, was based on the original meter developed by Mr Potter. Everyone could think of such an example.

I believe that the suppliers must be a source of research and development. However, this costs money and there may be a very long period before there is any return for such an outlay. Where can this cost be paid from? The supplier generally has no natural product such as oil or gas to sell and his source of income is limited to the profit made selling his metering systems to the oil and gas

companies. He is competing with a variety of companies, some of which do no research at all. Consequently if research and development is to be undertaken then there must be sufficient profit in the sale of the metering equipment to cover research cost. Over recent years with costs pruned to a minimum by the suppliers in response to the market demand there is little to spare for research and development and suppliers are forced to closely examine the case for financial outlay in this area. Again, for this reason, I would make the plea for more joint ventures to ensure that meaningful research and development continues on as wide a basis as possible. Remember no single group is the holder of all knowledge in the measurement field.

12. DOCUMENTATION

12.1 Over ten years work in this industry there has been an exponential rise in the amount of paper produced by the supplier of metering equipment. Quotations are more and more extensive. The customer demands to review more and more documents and drawings and these pass back and forth being amended, revised, updated, finalised, reviewed, audited, as built, as constructed and so on and so forth. It seems to be an ever growing game.

Does it produce a better system? Perhaps, since mistakes can be made, and more heads looking at something will surely eliminate many errors but I wonder if most of those errors would not have been identified and corrected by knowledgeable suppliers or oil company personnel before the equipment left the suppliers.

What happens also to the many copies (6 to 12) of certificates supplied? Could one copy not simply be kept in a central location along with a microfilm copy?

12.2 A plea from the supplier would be "Please Mr Oil or Gas Company could you devote some of your resources to identifying means of reducing any unnecessary paper being used". Computers do not seem to be the answer since more paper seems to be required to have the information in such a manner that it can be fed into the computer. Again the computer spews out more and more paper.

12.3 The communications now available in metering have been one of the areas of quite extraordinary development over the last decade. The round differential pressure chart has long disappeared and young engineers are unfamiliar with a planimeter.

Results from a single meter can be fed almost

immediately to central processing areas many kilometres away without one piece of paper being produced or handled.

13. AREAS FOR IMPROVEMENT

13.1 As we are considering the supply of a Fiscal Metering Station let us conclude by a supplier's summary of areas for improvement. Firstly let us consider equipment and then procedural improvements.

13.2 Equipment improvements in metering are now becoming evident. The search for a mass measurement rather than that of a volume has seen the Coriollis meter now reach the market place and it will be interesting to see just how large in size it can become and be a viable alternative. The promise of the Ultrasonic meter to finally provide a meaningful alternative to the orifice meter for gas measurement is an exciting development.

The small volume prover developments have brought a breath of fresh thinking into the whole field of meter calibration. Provided the basic fact that, "the objective of the prover is to calibrate the meter" is not lost sight of then there is going to be much more exciting features in this area.

Much still has to be done in the area of

instrumentation and in line densitometers, "smart" transmitters, in-line gas chromatographs are encouraging moves.

What about a reduction in perhaps the heaviest part of the metering station? Namely the valves and actuators. There seems to be an area here requiring much development work.

3.3 What has been called procedural improvements for the supplier would include many of the items mentioned previously i.e.

i Use international standards wherever possible

ii Involve the supplier as early as possible in a project.

iii Consider the use of a previously designed system from a specific supplier

iv Pay companies for quoting major systems

v Continue to develop the Q.A. philosophy and encourage Inspectors to have an appreciation greater than the minutia of a specification.

vi Do not squeeze price to the extent that good metering is barely achieved.

vii Do not ask for unrealistic deliveries when these often are not essential.

viii Let there be more joint ventures in research and development.

ix Leave the Norwegian forests in place and reduce the volume of paperwork.

References

[1] Paper presented at the North Sea Flow Measurement Workshop, a workshop arranged by NFOGM & TUV-NEL

Note that this reference was not part of the original paper, but has been added subsequently to make the paper searchable in Google Scholar.