Technology for Air Pollution Control

by
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A. DEFINING THE APC PROBLEM

All technology for APC hinges on precise determination and definition of the pollution problem posed by the works or factory under scrutiny.

B. WHO DEFINES THE PROBLEM?

This raises a practical question which must be answered at the outset for the problem to be satisfactorily solved. Who defines the pollution problem as such? Logically and ideally, the industrial client and the APC contractor, working together in the closest collaboration.

The planning engineer employed by the client is almost certain to have a very precise idea of the pollution problem at the works under his control. It is also very likely that he will have a sound technical knowledge of what steps must be taken to reduce it. But in his capacity as engineer he has to cope with many other technical problems besides pollution. Moreover, APC technology is a new and sophisticated branch of engineering which demands specialised knowledge and skills. This is where the APC engineer enters the scene. Needless to say, any APC contractor must have access to the right technological knowledge to isolate and define any pollution problem. If he lacks know-how, the client could be at a technical disadvantage and the pollution problem cannot be determined or defined correctly.

C. SOPHISTICATED TECHNIQUES

We have alluded already to the rising sophistication of APC technology. This process can only intensify, especially as the standards of gas cleaning rise and the limits of reduction are lifted by the authorities in answer to a community increasingly preoccupied with its environment.

Technological expertise in South Africa stands at a respectable level, but local technical knowledge of some APC problems is restricted. This underlines heavily the importance of access to the newest developments overseas and this is where the overseas partner or associate of a South African contractor fills a vital role. Easy and quick reference can bring prompt answers to obscure problems.

D. SELECTING EQUIPMENT

Once the basic pollution problem has been analysed and defined and the industrial client and his contractor have reached agreement, the next step is selecting the right APC equipment. Here, there are several basic considerations which must receive attention if the most suitable equipment is to be selected, often at substantial expense.

E. QUESTION OF COMMERCIAL VALUE

At times the material recovered from an industrial operation by a gas cleaning plant, has a definite value. If so the industrialist installing APC equipment will want to recover as much of this product as he can market profitably. This factor will have a positive bearing on the reduction limits of the gas cleaning plant, inducing him and his consultant to design the apparatus up to the technical limit. Needless to say, this must escalate contract costs. The client will not be deterred by this if the material recovered can justify outlay by its sale in the market place. Nevertheless, this remains a subtle consideration since it takes in factors like future market prospects.

Predictably, the industrial situations where the extraction of pollutants from a manufacturing industrial process can be substantially profitable, are limited. The great majority of gas cleaning installations will deliver materials that have no ready sale in the market place. Indeed, this description applies to more than 90% of all APC plants. The sad fact of anti-pollution action is that it is almost invariably an unremunerative charge against the industrialist, who is obliged by public opinion and legislation to install costly apparatus.

Therefore the instances when the client determines his own reduction level are rare. Most times the operating parameters of his APC apparatus are prescribed for his category of industry by the Chief Air Pollution control Officer, in terms of South Africa's most comprehensive Air Pollution Control Act of 1965.

The CAPCO's answer to the question of selecting equipment for any pollution problem is the formula of "best practicable means". This, of course, will depend on the reduction limit he prescribes, which is inevitably influenced by demographic and other ecological factors in the immediate environment.

Understandably, the CAPCO will set higher emission standards in densely populated areas than open country, but he will also take into account projections of future population-spread for what are presently open areas. Examples which spring to mind are the SASOL II project, or the power station complex on the Highveld, a region always liable for various economic and social reasons, to dense population growth.

F. THE IMPLICATIONS OF SELECTING EQUIPOMENT

Various implications emerge once APC equipment has been selected. These can be economic as well as technical. They arise from various social and legal factors.

Natural Factors

The CAPCO's cardinal doctrine of best practicable means was not devised only for the benefit of the industrialist baulked by economic or technical limitations, when planning and installing gas cleaning equipment. Other practicable considerations in anti-pollution situations may be dictated by the needs of the whole community. For instance, where water is scarce in a particular region, the specifications of the CAPCO will be drawn around the utilisation of a "dry" process. Thus, though a "wet" process would be cheaper and more practicable for the client, the CAPCO will emphatically stipulate a "dry" process as being more practicable for an area with limited water resources.

Factor of Size

There are other implications to be considered when selecting equipment such as the volume of gas to be cleaned. At power stations this is so large, the use of electric precipitators is almost obligatory. Recently, however, American practice has turned to large baghouses, which are more sensitive in operation but offer higher efficiencies than precipitators can economically obtain. Indeed, when it comes to higher reduction levels, baghouses may be no costlier than precipitators. A simple instance: to increase the efficiency of a precipitator from the already high figure of 99% to 99,9%, its size would have to be doubled and hence the cost.

Again, where industrial fumes carry very fine solids, as in base mineral smelting, baghouses must be used. The cost of installing precipitators of the same efficiency would be too high. Precipitators are also ruled out by technical implications, because fine fumes may have high dust resistivity which makes capture in a precipitator very difficult. In a baghouse this is an easy matter.

The implications of selecting APC equipment for chemical industries raises different difficulties altogether. Chemical materials are at times highly corrosive or damaging to APC equipment. Special precautions become necessary, requiring special knowledge on the part of the contractor: a clear case of where access to the most sophisticated overseas experience becomes necessary.

The implications of social environment can have a decidedly legal character. Where a plant operates in the middle of a built-up area, it might have to satisfy by-laws even stricter than the requirements of the Clean Air Act.

Spatial Compatibility
Often overlooked is the factor of spatial compatibility. Briefly, is there room enough for the most suitable APC equipment? This can be a real headache for the plant designer. Insufficient space may force a change in the equipment selected to something which cannot meet the CAPCO's specification. Faced, however, with sheer physical impossibility, the authorities may accept the modification.

Implications of Cost
Implications of cost are often crucial; particularly today with the national economy running at a low ebb. Consider a power station in the platteland where a precipitator would be the only apparatus to meet the CAPCO's full requirements. Yet economics might force an industrialist to accept a mechanical collector of lower efficiency, which the CAPCO might have to concede in the current economic climate. Technically this is unsound, but there are even stronger social and economic disqualifications. The under-populated platteland could fill up at a later date, making higher reduction levels imperative. Existing plant might well have to be scrapped; a total loss for the client's account, plus the installation of a totally new plant at exorbitant expense.

This cannot be helped as at present the money is simply not there. A practical suggestion here is to leave sufficient space for a larger, more efficient plant later. Twenty years ago the first SASOL project was built with insufficient room for precipitators. When they finally got round to filling the gap, swingeing costs had to be faced.

G. **CONSIDERATION OF FUTURE SIZE**
The question of leaving space for additional plant focuses attention on plant size. Indeed, once the type of equipment has been decided, this is all-important. Yet, it is often overlooked by planning staff of the client company. Their eyes are fixed too close on present capacity. Unknown to them top management already may have a secret plan to extend operations progressively over the years to come.

Company planners should know about such plans and this is where the APC consultant can play a decisive part. As an outsider contracted for a single project he finds it easy to ask questions in depth about future plans to extend capacity. He can stress that extensions at some later date are far costlier than designing plant today to accommodate projected growth in future.

H. **CONFIDENCE AND COMMUNICATION**
The tricky question of discussing confidential company policy matters with a contractor underlies the importance of complete rapport between client and APC consultant, from the first contact. The client must have confidence in his contractor. While recognising that the latter is in business to make money, he should remember the contractor is bound by an engineer's professional ethics.

To the same sensitive area belong the doubts and fears which harass a client who, after placing a contract, discovers at the planning stage higher requirements which demand equipment additional to the original APC plant. The client may be afraid to commit himself to additional expense at this stage, because the APC contractor might take him for a ride. The fact must be faced that money will have to be spent and the bill is bound to be lower today as part of an on-going contract than for a new project later on. There is also the spectre of inflation to think of.

There are excellent grounds for clients to have confidence in reputable APC contractors. No engineer worth his salt is likely to risk his good name in the market place through sharp practice.

I. **THE WAY TO DO THE JOB**
The closest co-operation between client and contractor is absolutely essential. This can be put on a practical footing by them drawing up a timetable together, which settles finally, when and how to do what. In doing so the client must not try to squeeze the impossible out of the contractor. If the latter over-commits his company it could force him onto his knees, with unhappy economic consequences for the client as well. All operating dates and deadlines should be realistic and the timetable must be related to conditions ruling at the construction site.

Here the contractor's biggest grouse is that the APC man is always assigned last place in the queue for attention from the project manager. The latter must not overlook physical constants like the man-power load. A project designed physically to carry 10 men cannot accommodate 100. Then there are social obligations like adequate housing for construction staff.

Key man in this context is the client's project manager: the man responsible on site. He is the guarantor for job achievement. If he is competent, the job will go like a rocket. But he must be boss with ability enough to match the authority he must have to co-ordinate as well as control all sub-contractors, including the APC man.

J. **MAINTENANCE OF APC PLANT**
Every client who has placed an order for APC plant knows this is expensive hardware. He will naturally put a value on his investment, expect value for his money in the years to come. A plant life of 20 years is normal for any equipment, including APC. The key to maintaining plant value is constant plant maintenance.

A new and practical development in this area finds the APC engineer offering his services to the client in a maintenance capacity. This makes good sense. As he designed and built it, he knows best what can go wrong; can repair it quicker and, understandably, cheaper. On his side he must be geared at all times to carry out this maintenance service. As a matter of reference, it is in his own interest to see that his equipment works properly.

K. **EFFICIENT OPERATORS**
Maintenance is the main ingredient in keeping gas cleaning plant operating at the highest performance level. The big stumbling block is a simple economic fact: APC equipment is not directly productive and is way down the list of operating priorities. The APC engineer is best qualified to remedy this shortcoming. He must train the plant operator properly, on the job, giving him full instructions, not only verbally but in writing.

When an operator finds it difficult to ensure maintenance standards from a lack of skilled man-power, the APC engineer must come forward with his after-sales maintenance service. Clients in South Africa are still reluctant to accept such offers, yet it is a long-established and respected practice in highly industrialised countries. Naturally, maintenance service cannot be done for nothing. Effective legal contracts are drawn up to make sure the customer gets value for money. It is rather like insuring plant operations.

Certainly, the CAPCO is keen to see all APC contractors offer maintenance services. He would also like to see this kind of offer accepted by customers, as it ensures that reduction standards will be permanently maintained.

Most members of our association are willing to offer maintenance services and acceptance of this responsibility can only be good for professional reputations. Besides, it ensures lasting contact with the customer, bringing economic as well as professional benefits.

Bad maintenance carries a painful legal sting in its tail. If the CAPCO finds gas cleaning plant operating below specification through weak maintenance, he has legal authority to close down the works till reduction standards are restored. The industrialist still has to meet a maintenance bill, while writing off a substantial loss for down-time over an extended period. In a word, communication and rapport between client and contractor, must go on after commissioning of APC plant, if gas cleaning standards are to be maintained.

(Vervolg van Bladsy 2)

met hierdie verdienstelike werk voort te gaan.

Dit is dan nou vir my 'n genoeë om hierdie Simposium oop te verklaar, en wil ek u alle sukses daarmee toewens.