THE CONSULTANT’S ROLE IN FURNACE DESIGN AND SELECTION

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ABSTRACT

The author expresses his opinions on the problems currently facing the consulting engineer in the design and construction of municipal incinerator plants. Specific consideration is given to the role of the Engineer in the design and selection of the various items of component equipment and the expectations ultimately to be derived from an operating standpoint.

Municipal officials are demanding more complete programming of the project, starting with feasibility studies, public presentations, planning for its construction costs and in some instances, advising in the actual financing. The consultant is being pressured not only for increased accuracy in cost estimates, but is expected to assume a greater responsibility in regard to the contractors’ and manufacturers’ performance as well as the supervision of construction and the ultimate operation of the entire facility.

The author reports a tremendous need for a freer exchange of information between consultants on past experience with contractors, suppliers, and/or manufacturers of items of relatively new concept and design. Large savings would result.

THE ENGINEER’S EXPANDING ROLE

Throughout all phases of planning, design and construction of municipal incinerator plants, the consulting engineer is faced with wide gaps in the public understanding of his role and responsibilities both professional and legal. Municipal leaders, most of them laymen, are demanding precision in estimates and firm guarantees of results which the changing state of the art hardly permits.

The last twenty years has probably seen more advance in the technology of the incineration process than any other period, and the end to change is not yet in sight [1]. This fact in itself complicates what might otherwise be a comparatively straightforward task of design, selection of component equipment, and supervision of construction.

It brings with it the necessity for constant investigation of new developments, and the pressure to decide whether to go with the new and untested or stick to the old proven until there is some consensus in the field that the ultimate has been reached in improvement in any particular direction.

More municipalities demand complete programming of the project, beginning with feasibility studies which frequently encompass the total incineration needs for the community in question, not only for the present, but projected well into the future. The consulting engineer is asked to assist in convincing the public of the need for the plant by appearing at public meetings to explain the project and sometimes to defend himself and his work against politically inspired attacks in which he is the target only because he is convenient. When these hurdles are passed, he is expected to advise the municipality on its planning to cover the costs of construction, and in some cases is even expected to assist in planning long-term financing.
Throughout all these steps, he is expected to assume greater responsibility.

In addition, there is increasing demand for the kind of accuracy in cost estimates that would require a never-failing crystal ball. Also, as the project progresses, the consulting engineer is expected to assume far greater responsibility for the actions of others than was ever expected in the past. It is assumed that he is responsible for performance of both contractors and manufacturers, as well as supervision of construction, and he is called upon to answer for the ultimate operation of the entire facility.

To municipal leaders, who feel that they are responsible to the public for the performance of the consultants and who often do not themselves have the training and experience to handle the administrative and business details of such a project, these may seem like perfectly reasonable requests and demands. Unfortunately, due to the present nature of the incinerator industry, this is not the case. Only if major changes in the industry similar to those developed in allied fields, such as the power and process industries can be brought about, can the independent consulting engineer be expected to cope with these additional responsibilities which are over and above his primary responsibility to design a facility to meet his client’s need, within his client’s budget, and to assure that it has been constructed in accordance with his specifications.

EQUIPMENT SELECTION AND WARRANTY

One of the greatest problems facing the consulting engineer is in the selection of equipment. Since he is not in the position to carry on the extensive testing of new developments on behalf of his client, to determine whether or not the equipment will function as represented by the manufacturer, he is forced by circumstances to take a great deal on faith and prior experience. In view of this, he should be able to get from the manufacturer of incinerator equipment the same kind of guarantee, for example, that one can get from a manufacturer of air-conditioning equipment. In other words, a particular grate should be guaranteed to handle a specific loading, just as an air-conditioning unit is warranted to handle a specific number of Btu’s. Without this kind of warranty, unless the consulting engineer has had full prior experience with the equipment in question, he is frequently in the position of specifying without complete assurance.

Manufacturers should be required by contract to review design and indicate whether their equipment is satisfactory for the application intended. Then, in the event that the item does not function as they say it will, a penalty should be included.

One way to handle the problem of assurance on the functioning of a particular piece of equipment is to establish a direct contract with the manufacturer through the contractor. In a recent project, our firm undertook to do just this; it required that bidders for the grate be willing to warranty their equipment. While a few suppliers refused to go along and declined to submit quotations, several firms accepted the conditions. The grate manufacturer expressly undertook to review design and let us know whether it was a satisfactory application of his equipment, in which case he would then guarantee that his equipment would burn x number of tons of a particular composition (degree of combustibility) in a specified amount of time. In this way, we were assured that a performance standard would be adhered to within the budget based on his bid, or failing that, the owner had legal recourse, not against the consulting engineer or the contractor but, where the responsibility belonged, against the manufacturer of the vital equipment.

In order to supply this kind of warranty, manufacturers will have to maintain closer quality control than has heretofore been customary. Only by controlling quality during the manufacture of the equipment can they minimize the amount of “field adjustment” required of the contractor and/or the consulting engineer who is customarily required to make a supposedly tested component function properly.

In relationships with contractors, too, there must be considerable amendment. Bidding practices should be altered to assure that all bidders are pre-qualified and can prove their competence on similar completed projects of comparable size and scope. Otherwise, the consulting engineer may find that a low bid has given the award to a contractor who does not understand the complexity of the project, does not have a competent and adequate technical staff or is not willing to do his part in seeing that the equipment will function as required. In the present state of the art and with inadequate standards in the manufacture of equipment, the contractor must be required to do everything he can to make the job work, providing he has had an opportunity to review the design and holds it to be adequate.

This is one point that can be written into specifications: a requirement that contractors must check the design and approve it. Once this is done, the contractor’s area of responsibility is more clearly defined [2].

One of the ways attempted to circumvent the problem of field adjustments has been the offer by some firms to
undertake complete responsibility by supplying what is in effect a package unit. Unfortunately, the only way such an undertaking can be successful is by standardizing the package, and this tends to limit technological development. Clients should be made aware that incineration is still very much in the development stage, and each new project carries with it the challenge and the chance for another breakthrough in design. At the very least, each new plant design can profit from the experience gained on past projects. There is the added danger that accepting a standard package would bring with it the necessity of accepting some items of equipment of lesser quality than might be used in an individual design.

**INFORMATION EXCHANGE SOUGHT**

One of the most pressing needs at the moment is for some method by which consulting engineers can exchange information they have garnered by experience with contractors, suppliers, and manufacturers, particularly manufacturers of equipment that is new in concept and design. Without the test of time and experience to depend on, consultants could be of immeasurable assistance to each other in pointing out areas of difficulty, whether it be in terms of manufacturers or suppliers whose equipment does not live up to assurances and expectations, or contractors whose performance leaves something to be desired. It should be possible within the framework of our professional societies to set up a procedure that would be fair and impartial, in which provision could be made for authenticating information received.

We should also be able to set up some kind of machinery to handle client complaints or misunderstandings. As things stand now, consultants are too ready to impugn each other's judgments, both privately and publicly. Too frequently even the most expert witness in a court case may not be fully apprised of all the circumstances in a particular situation, and the mere fact that he might have done something different does not necessarily constitute malpractice on the part of the engineer he may be criticizing. Many of the cases which now find their way to the courts might be handled much more expeditiously and fairly for everyone concerned if retained within professional confines, at least until such time as the incineration process ceases to be an art in a state of flux, definitive standards have been developed, and a vast number of most questions have been decided and resolved.

**REFERENCES**
