REDUCTION IN INVENTORIES THROUGH STANDARDIZATION

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Probably many of you here are better qualified to present this paper, but I welcomed the opportunity when Buck Weaver and Al Kelly asked me to appear on this program.

Problems in inventory, standardization, simplification, and the purchasing agent’s relationship to the operating department have always been a challenge to me.

Meeting here today with the American Petroleum Institute is a real opportunity for us who are oil-company buyers, as it will permit us to let the API members know that we have contributed much to the industry, and that we can do much more by defining several important projects and definitely organizing to accomplish them.

In High Places

Purchasing men, during and after the war, were placed in high positions in the Petroleum Administration for War and the Petroleum Administration for Defense. They protected the industry by adequate procurement of supplies during times of critical shortages. They include Frank Watts, of Humble; Al Collins, of Shell; Dick Morrison, of Texas; Buck Weaver, of our company; Bill Beck, of Socony; Herb Hansen, of Superior—just to name a few. Many others performed a noble job in Washington, and brought glory to our profession.

The purchasing agent has also done considerable work for the American Petroleum Institute—most of it behind the scenes, and through our engineering groups. The simplified casing list is an example because, without our survey work and development of the economics in such a program, I do not believe we could have interested our engineers in carrying this through the API committees as rapidly as they did.

Standardization

Maybe many of you are not familiar with API standardization work. So “Cos” Cosgrove dug up some information for me on the history of this phase of the work. It is most interesting, and I should like to brief it for you.

Standardization of oil-field equipment had its inception at the first annual meeting of the American Petroleum Institute in Washington, D. C., in 1919. Representatives of the three large manufacturers met with the Institute officials to discuss what could be done, and the question was considered at length at subsequent annual meetings. The Purchasing Agents Association of Tulsa took steps to adopt standards on rig iron, and the Mid-Continent Oil and Gas Association investigated the possibility of standardizing oil-country tubular goods and the preparation of casing specifications. This is the first recorded contribution to the Institute by the purchasing agent.

The Institute, at St. Louis in December 1922, adopted resolutions calling for standardization, simplification, and improvement of oil-industry equipment, and requested the API Board of Directors to appoint committees to carry on the work in the various phases of the industry.

Committee chairmen were top men in the industry, and much was accomplished in the next few years. This work was in cooperation with other agencies already at work, such as the American Society for Testing Materials, the Bureau of Mines, the National Bureau of Standards, the Simplification Bureau of the Department of Commerce, and others. Casing, drill pipe, cable tools, rig irons, and rotary tool joints were covered first, and then other committees were appointed on belting, boilers, and rotary-drilling equipment. Investigations were started on derricks, wire rope, and manila cordage.

In May of 1924 a central committee on standardization was organized, with an orderly program and methods of procedure. Special committees were appointed on pumping equipment, and on steel tanks for oil storage. The entire standardization program embraced 10 main classes of material. Specifications are prepared by regularly appointed special committees, composed of representatives of oil operators and manufacturers. Each special committee is divided into the five main oil-producing districts, with a subcommittee in each.

Service on these committees is purely voluntary. Many committees have served many years, and have paid their own expenses to the meetings. They have conducted innumerable tests, exhaustive investigations, and the like—without remuneration. Their work is generally regarded as a service to the oil industry for which there is no adequate compensation.

The purpose of the entire standardization program of the Institute has been to obtain:

a. Uniformity of proper minimum and maximum chemical and physical properties.

b. Interchangeability of material.

c. Improved workmanship.

The work has now progressed to the point where specifications have been adopted covering practically all of the principal items used in the drilling for and the producing of oil, including line pipe and steel tanks for oil storage.

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How About the Others?

This pretty well takes care of the producing end of our business, but what about marketing; and what about refining? So far as I know, there are no specifications set up for marketing-department materials which are universally used by all operators—not even on major pieces of equipment. Four or five years ago we became concerned about our methods of buying service-station underground storage tanks. They were made up to our own specification and, in order to obtain the right price, we had to have them made up in lots and inventory them, or else issue a firm commitment for a quantity to be withdrawn over a period of time. We checked with the American Petroleum Institute and other agencies to see if there were any standards and specifications, or if there was or had been any work done by other groups on this particular item. We also contacted the larger manufacturers of underground storage tanks on the Pacific Coast, as well as the purchasing agents of all of the major oil companies and some of the independents. Everyone agreed that something should be done. Therefore, we had one of our engineers in the purchasing department carry the ball, and prepare drawings and discuss the possibilities of standardization with all others concerned. Several months elapsed, but suitable standards were finally adopted which were agreeable to all users, and acceptable to the manufacturers as the most economical to fabricate. These service-station underground storage-tank specifications are now known as the Pacific Coast standards, but that doesn’t mean very much—because there is no agency maintaining the specifications. Whenever anyone wants to make a change in the standards, he writes to us. Whenever anyone wants drawings, he writes to us. We make the contacts with the other companies to maintain the standards. We furnish the drawings, when requested. We should like to get rid of the job as one well done, and let some agency take over. Perhaps the Institute is the proper spot.

Considerable Savings

Incidentally, this effort on our part, viz., the support which we have received from the other oil companies and from the manufacturers, has resulted in considerable saving to both the consumer and the manufacturers. The use of a standard tank permits the fabricator to purchase and use standard mill-size sheets, thereby cutting waste to a minimum. He is also able to purchase materials in quantity and make up a number of standard tanks for sale to any customer. This reduces his cost, and any savings to a manufacturer or distributor eventually are reflected in a saving to the purchaser.

Inventory Elimination

Speaking of inventories, I should like to go back to the middle 1940’s when top management of most companies started looking at the inventory figures with a critical eye, and when the result of this examination was an ultimatum to the purchasing agent, or storekeeper, or whoever had charge of inventories, to reduce them drastically; or, in some cases (ours included), to eliminate them altogether, if possible.

In reviewing our production operations, we found it not too difficult to eliminate inventories altogether and depend entirely on supply-company field stores for our requirements. This was possible because of the excellent work done by the American Petroleum Institute mentioned earlier in this paper. The rigs and pumping units are to API specifications; the casing and wellhead fittings are to API specifications; and the bottomhole pumps and sucker rods are specification material. The oil flows through API line pipe into API tanks, and is gaged by API methods. This fine degree of standardization has permitted the oil-field supply store to carry our inventories for us, as his stocks are common to all customers.

I must admit that, at the present time, there is an indicated shortage of oil-country tubular goods, and certain regulations make it mandatory for us to maintain inventories of this item. This condition, we hope, will not continue for an extended period. When supply again meets demand, I feel sure that suitable arrangements can be made with the mills and the distributors to place stocks of tubular goods in strategic locations in the various oil-producing areas for customer call, and this will relieve the industry of the huge sums of money now tied up.

The Institute may have to play a part in this arrangement, as the simplified tubular list will have to be maintained, or possibly simplified further, because it is a sure thing that the jobber will not want to stock the some 320 sizes, weights, and grades which were in use several years ago. The purchasing agent can help the Institute in this program.

A Real Problem

Now back to inventories:—We have taken care of production by approximately 100 per cent elimination of stocks. The marketing department is no problem, particularly as we have the service-station underground storage-tank supply whipped.

Now we come to the refinery or manufacturing department. This is a real inventory problem; and, in spite of what we do, the amount keeps going up and up. Every time we add a new unit, there are spare parts and special chemicals, and special pipe and fittings, which must be purchased and put in stock to keep the unit onstream. I don’t know what can be done through the Institute to correct this problem on an overall scale, but I do believe that there are at least two items in everyone’s refinery inventory which could be standardized to a degree, with tremendous savings to be realized by all of us.

I refer specifically to fired heater tubes and condenser tubes; and, to bring this out more clearly, I should like to cite our own problem, for I believe most of you have the same problem.
Process matters are the heater designer's chief consideration. Flow rates, heat-transfer coefficients, pressure drops, draft losses, and many other design factors are his first concern. From a study of these, and from a knowledge of materials (e.g., steel tubing, refractories, and insulation), of equipment (e.g., burners, terminal fittings, etc.), and of structural design and costs (e.g., material, equipment, and fuel and power), the designer develops a design which, for the specific conditions of each particular job, is economical—economical from the standpoint of thermal efficiency and operating efficiency, but usually totally uneconomical from the standpoint of procurement and warehousing of the necessary spare parts for years to come.

Dictated by process and operating influences only—with each problem different—each heater is different, except when size considerations lead to duplication in the same refinery unit.

When the heater arrives at the refinery, or shortly before, the storekeeper must add to his already burdensome heater-parts stock by ordering more tubes (also more terminals and brackets) of the new diameter, new length, new wall thickness, new material, and new type ends which the heater designer happened to come up with. Of course, this problem can be reduced if the heater designer is limited to certain sizes of tubes by the purchaser's specifications, or by his own sympathy with the customer's spare-parts problem. Yet, in practice, how often is this done? In our experience, practically never. Even if original specifications include certain tube sizes as flatly required or preferred, in the final go-around on the purchase this limitation is often lifted by the purchaser's engineers who favor operational benefits, or who wish to cut corners to avoid over-expenditure. The storekeeper's voice, remote from the firing line, is not heard.

$10,000 may be saved in heater cost or in power cost for heater charge pumps, but the refiner may pay out $50,000 during the life of the heater in warehousing costs. If he does not control or evaluate inventory, he may never know this; but it is costing him just the same.

In our 2 principal California refineries now operating at a total crude capacity of 120,000 bbl per day, we have a total of 50 fired oil heaters—including 3 new ones being erected.

In these refineries our oil-storage tanks conform to API standards; our fractionating columns and pressure vessels are built to the joint API-ASME code. Yet our fired heaters, which rank with these in capital investment and above them in maintenance costs, have been built without standardization, largely because no applicable code or standard exists.

What has been the result of this absence of standardization? First, except for a few duplicate heaters within the same refinery unit, no 2 of our 50 heaters are alike. We have 12 tube diameters, 30 tube lengths, 12 tube-wall thicknesses, 4 tube materials, 4 types of tube ends, and both plain and finned tubes in oil coils alone. Steam coils in many heaters would add to their numbers. Our terminal fittings, return bends, and tube-support brackets are in similar variety. Second, our stock of spare tubes, terminals, and brackets—with little interchangeability—includes a great variety of items. Of 28 tubes now stocked as spares, only 1 is common to the 2 refineries. Heater parts comprise one of the largest single items in our inventory, and amount to 25 per cent of the total inventory value.

$400,000 is the money tied up in spares. Interest alone, at 6 per cent, costs us $24,000 a year. Total warehousing costs are about 25 per cent. Therefore, it is costing us approximately $100,000 a year to keep this stock.

To attack this problem in a way so as to benefit the entire oil industry—and, eventually, the tube mills and jobbers as well—effort should be on a national basis and on a long-term basis; i.e., an API standard should be developed for refinery-type fired oil heaters—a standard which would leave the designer reasonable latitude, yet not the almost infinite latitude which he has today—a standard which would give the storekeeper or purchasing agent not a predominant voice in selection, but a voice commensurate with the process engineer, the mechanical engineer, and the operating superintendent. Such a standard would be a long step forward.

In condenser and heat-exchanger tubes—and perhaps in shell-and-tube exchangers themselves—a similar field for improvement is open. We find that our stock of spare exchanger tubes at the 2 refineries includes 16 lengths, 6 gages, and 5 materials—all in diameters from \( \frac{3}{4} \) in. to 11 in. So great is the diversification that, of 38 tubes now stocked, only 1 is common to the 2 refineries.

The stock value in our inventory on this item is $300,000, and equals one-fifth of the total inventory.

With the fired heater tubes representing 25 per cent of the inventory, and with condenser or exchanger tubes representing 20 per cent of the total, we know where 55 per cent of the moneys is tied up.

We could mention several other problems of lesser importance; but, in my opinion, if it is agreed to tackle something of this order, we should concentrate on one project, and not scatter our efforts.

Gentlemen, this is a fertile field for us to work in and, with the help of our good engineers and the design engineers, we should be able to come up with some simplified standards which would reduce these inventories to a minimum.