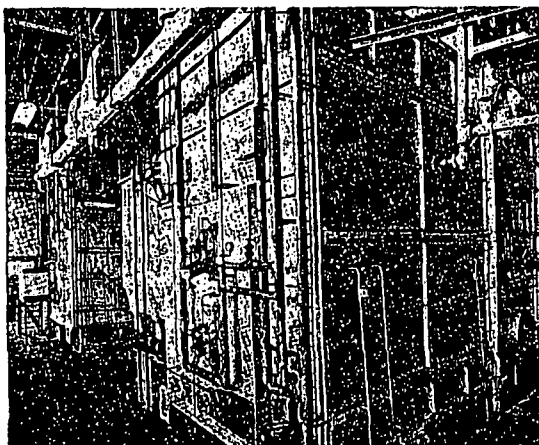


New Boiler-Plant Design Features

Oil-fired plant, built on site of coal-fired one without interrupting process service, gives needed capacity, reduces steam costs. Adequate meters and automatic combustion control permit plant engineers to obtain practical boiler-plant performance every day

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NEW BOILER PLANT has two 30,000-lb-per-hr boilers, designed for 200 psi but operated at 125 psi and 425 F total temperature. One old coal-fired boiler, shown between the two new ones, was retained for operation in emergencies

FOR OVER 50 YEARS Melchers Distilleries has been at Berthierville, on the St. Lawrence River about 50 miles from Montreal. The plant has been modernized several times to maintain high standards of efficiency and the quality of its products—high-grade Scotch and rye whiskeys, London and Geneva gins, industrial and potable alcohols from both grain and molasses. Latest improvement is complete modernization of the boiler plant, something that could not be done until now because of war restrictions.

During the war, as in all Canadian distilleries, total production capacity was devoted to manufacture of industrial alcohol for synthetic rubber and chemicals. The return of peace found the steam plant practically worn out. Aged equipment had been forced continuously for maximum production, and maintenance had been inadequate because of the difficulty of holding experienced operators and making necessary repairs and replacements. Accordingly, the company launched a modernization program, and retained the writer as consulting engineer to design and supervise the construction of a new boiler plant.

Steam Demands. A distillery requires large quantities of medium- and low-pressure steam for still operations, grain cooking, regulating mash-vat temperatures and drying spent grain, the

latter marketed for farm-stock feed. In winter, steam demands for building heating are heavy because for long periods outside temperature remains around zero, and at times drops to 30 F below, or lower.

Steam demands for certain distillery processes fluctuate widely. Grain cookers and some stills operate on live steam with requirements that may suddenly vary as much as 50%. Other stills call for continuous operation and uninterrupted steam supply.

The stills require large quantities of cooling water, which is pumped from the river. Because of difference in water temperature about three times as much water is required for the same production in summer as in winter. For this reason, as much annual production as possible is scheduled for the fall, winter and spring months. General plant overhaul and vacations take place in the summer, a period of light operations.

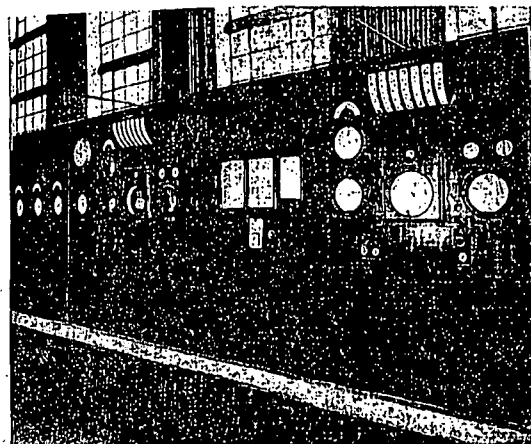
Taking consideration of these and other factors led to a boiler plant design that would have high efficiency and reliability, and be simple to operate. The fact that this distillery is the only one operated by the company further

enhances the importance of reliable continuous operation. Lost production cannot be supplied by another plant, as with companies operating several plants.

New Units Oil-Fired. Either high-grade coal or fuel oil could have been selected for firing the new boilers, but even though the old boilers were coal fired, oil was chosen for several reasons. It is as economical a fuel as coal at the plant location. It eliminates coal dust around production departments where cleanliness is a prime consideration. Either coal or oil can be received by railway, but oil is much easier to store and handle than coal, particularly in winter during periods of heavy snows and subzero temperatures. Handling and storing oil requires much less effort than coal does, an important consideration under present conditions. An oil-fired plant is simpler in design and operation, and avoids the large fuel storage required by coal. Oil firing is well adapted to handling the widely fluctuating process and heating steam demands.

Steam-Pressure Selection. Power, process-and-heating steam for the plant could have been supplied by installing

Reliability and Simple Operation



INDICATING AND RECORDING METERS: A full complement of these instruments has been provided for the boilers. They are also equipped with automatic control to maintain high operating efficiency over wide range of steaming load

high-pressure boilers and backpressure bleeder turbines. But these units require a considerably larger investment in equipment, a much more complicated plant to operate, and a more highly skilled operating staff than a simple boiler plant. The management wanted to avoid these responsibilities because there were no compensating factors here that would make them worthwhile.

Power, which can be purchased from the local utility at low rates, is supplied from a large hydroelectric system. Thus these rates can be expected to remain fairly constant no matter what may happen to fuel costs. Therefore provisions were not made in the new boiler-plant design for future power generation. This led to selecting boilers to provide steam at a pressure and temperature required for process and heating only.

A New Building. It was desirable to build the new boiler plant on the site of the old one, which contained three watertube boilers of 2500 sq ft and one hr of 1400 sq ft of heating surface, all hand fired. Immediate and future steam demands indicated that the new boiler capacity should be about double that of the old in two new units

with provision for a third when required.

A greatly enlarged plant had to be built on the site of the old one without interfering with distillery operations. The first step in this program was to construct around the old plant a new building, designed by Architect Charles David, of suitable size to house three new boilers, and their auxiliaries and control equipment (plan at top of p. 68). With completion of the new building, the old boilerhouse was removed to permit installation of the new boilers. Construction of the new plant was considerably simplified by not having to provide a coal bunker and other storage facilities.

The plant was so located that when one old hr boiler was removed space was available for the first new one. When this unit, as well as a new stack for three boilers, was erected and in operation it was cut into service; then the two old watertube boilers in the opposite end of the plant were removed and the second new boiler installed.

Photo on p. 66 shows the interior of the new boiler plant where the one remaining old boiler can be seen with

a ladder in front of it. This unit has been retained in standby service for coal firing if, because of a strike or other cause, the fuel-oil supply should fail temporarily. Future plant expansion includes installation of a third boiler between the two new ones where there will be ample space when the old one is removed. The new plant was designed with this expansion in view, which would provide a peak steaming capacity of 100,000 lb per hr.

Two New Boilers. Designed for 200 psi, each of the new units with water-wall and slag-screen furnaces, has a continuous steaming capacity of 30,000 lb per hr and will operate at 125 psi and 50- to 75-F superheat, a total temperature of 400 to 425 F. Each unit has a maximum 2-hr steaming rate of 35,000 lb per hr. To meet requirements for a boiler and furnace efficiency of over 84%, tubular air heaters were provided, designed to heat the combustion air from 80 to about 300 F.

Boiler Auxiliaries. To simplify plant design and operation induced-draft fans were omitted and draft provided by a forced-draft fan on each boiler and a 175-ft stack that serves the two. To compensate for the absence of induced-draft fans and to obtain high efficiency the boilers have been designed for low draft losses by keeping the gas velocities comparatively low through them.

Natural draft was favored by maximum steam demands coinciding with the higher stack draft available in winter when outside temperatures are lowest. With 80-F outside temperatures, stack draft is ample to maintain a furnace pressure of -0.1 in. of water when generating 25,000 lb of steam per hour. In summer should the boiler have to operate temporarily at a higher steaming rate, a damper permits bypassing part of the gas around the air heater with a slight reduction in efficiency (see bottom of p. 68). During winter outside temperature is such that draft is ample under all load conditions without bypassing the air heater.

Two forced-draft variable-capacity mechanical atomization burners, one above the other in the furnace front, fires each boiler with bunker-C fuel oil. At present oil is an economical fuel for many applications in this part of the Province of Quebec but in the future the price differential may favor high-