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N.C.

Standardized Insulation Nets New Memphis Plant Big Savings

by MILTON H. ELLIS, JR., President,
The M. H. Ellis Co.

231642

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ırdized Insulation Nets New Memphis Plant Big Savings

perature range, Bems and Roe ons for the most economical use H. Allen Electric Generating e result of their computations

lifferent materials used to prevent he loss of previous heat from an operating boiler are being reduced and heir application methods simplified. The availability of economical and fficient insulating materials, which an be used over a wide range of ervice temperatures and adapted to number of sound application techniques, have made this standardization possible for a number of individual boiler projects.

As an example of how simplification through standardization is being pplied, take the insulation of the hree 2,100,000-lb-per-hr boilers recently erected by The Babcock & Wilcox Co at the Thos. H. Allen Electric Generating Station for the Light, Gas & Water Division of the City of Memphis. The station's design permits expansion to double its present net capability of 312,500 kilowatts, as required by future loads of Memphis and Shelby County.

On each of these huge units, over 1,500,000 bd ft of spun mineral-wool block was used as the basic insulating material by the insulation contractor, the M. H. Ellis Co. This versatile block insulates all flat surfaces and all cylindrical surfaces, 30 in. or greater in diameter, up to a maximum temperature of 1200 F. For the few surfaces hotter than this, a calcined, diatomaceous earth insulating block is used as the first, or hot-side, insulation course, and then it is covered with mineral-wool block. Block thickness was specified to provide an average exterior surface temperature of 130 F, based on an 80-F ambient temperature and air velocity of 60 ft per min.



Fig. 1. Metal finish applied over insulation on underside of recirculating gas duct. Background: Tubes of Unit 2

Block Is Versatile

In addition to its excellent thermal efficiency and wide service temperature range, the block, called Mono-Block by its manufacturer, Baldwin-Erret-Hill Inc. is extremely versatile. Such mechanical characteristics as its light weight, which makes it easy to handle; its resilience, which helps it conform to curved or interrupted surfaces; and the ease with which it can be cut and shaped to fit irregular areas were all factors which tended to facilitate its application.

This use of one basic insulating material in a few appropriate standard sizes reduced the insulation contractor's inventory problems, and made standardization of application methods simpler. Only two basic attachment methods were required — one for flat and one for curved surfaces.

* President, The M. H. Ellis Co.





Fig. 2. (left) The wires in groups of four extend through the first layer of insulating block, ready to hold second

Fig. 3. (Above) After installation of second layer, wire is criss-crossed in diamond pattern, at least two per block

Importance of the results of simplification can be readily imagined on a job the size of the Memphis installation. The largest municipal steam plant ever built at one time, this is one of the most highly publicized. The station has a rated capacity of 750,000 kw and an aggregate net capability of 312,500 kw. During the winter months it will burn coal, shipped in by Mississippi River barge, and during the summer the boilers may be fired by natural gas.

Simplification in boiler design and construction is also illustrated in the Memphis project by the Babcock & Wilcox practice of standardizing on just two insulation thicknesses for the saturated-pressure parts of the boiler, such as tubes, headers, and drums. Thickness is based on the steam pressure involved.

All sections carrying steam at pressures up to 1850 psi are insulated with a 3-in. thickness of medium-temperature insulation. These carrying steam at greater pressures are protected with 4-in. medium-temperature insulation. This results, perhaps, in over-insulation of certain hot surfaces but is considered to sufficiently simplify application to be economically justified. Certainly it is sound practice from the standpoint of additional thermal efficiency.

On this job the basic insulation attachment method used, with only a few exceptions, on every flat surface throughout the huge Memphis boilers



Fig. 4. Ease of handling h demonstrated as insulating block is cut to conform with either a curved or irregular surface

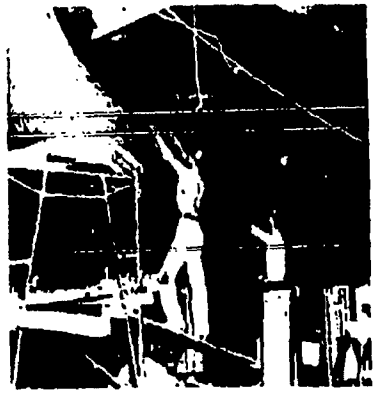

Fig. 5. Beveled edges, cut with small table saw, make tight-fitting seal for cylindrical surface of a 30-in. downcomer

Standardized Insulation Nets New Memphis Plant Big Savings

By looking at the K-factor and temperature range, Burns and Roe were able to select optimum conditions for the most economical use of thermal insulation at the Thos. H. Allen Electric Generating Plant in Memphis. This describes the result of their computations

By MILTON H. ELLIS, JR.*

TODAY'S LARGE, high-temperature, high-pressure steam generators are complex pieces of equipment requiring care and precision in erection and maintenance. However, one way that they can be simplified for erection crews and operating and maintenance personnel is to standardize their construction as much as possible.

One phase of boiler construction which lends itself well to standardization is thermal insulation. More and more, the number and types of different materials used to prevent the loss of precious heat from an operating boiler are being reduced and their application methods simplified. The availability of economical and efficient insulating materials, which can be used over a wide range of service temperatures and adapted to a number of sound application techniques, have made this standardization possible for a number of individual boiler projects.

As an example of how simplification through standardization is being applied, take the insulation of the three 2,100,000-lb-per-hr boilers recently erected by The Babcock & Wilcox Co at the Thos. H. Allen Electric Generating Station for the Light, Gas & Water Division of the City of Memphis. The station's design permits expansion to double its present net capability of 812,500 kilowatts, as required by future loads of Memphis and Shelby County.

On each of these huge units, over 1,500,000 bd ft of spun mineral-wool block was used as the basic insulating material by the insulation contractor, the M. H. Ellis Co. The versatile block insulates all flat surfaces and all cylindrical surfaces, 30 in. or greater in diameter, up to a maximum temperature of 1200 F. For the few surfaces hotter than this, a calcined, diatomaceous earth insulating block is used as the first, or hot-side, insulation course, and then it is covered with mineral-wool block. Block thickness was specified to provide an average exterior surface temperature of 130 F, based on an 80-F ambient temperature and air velocity of 50 ft per min.

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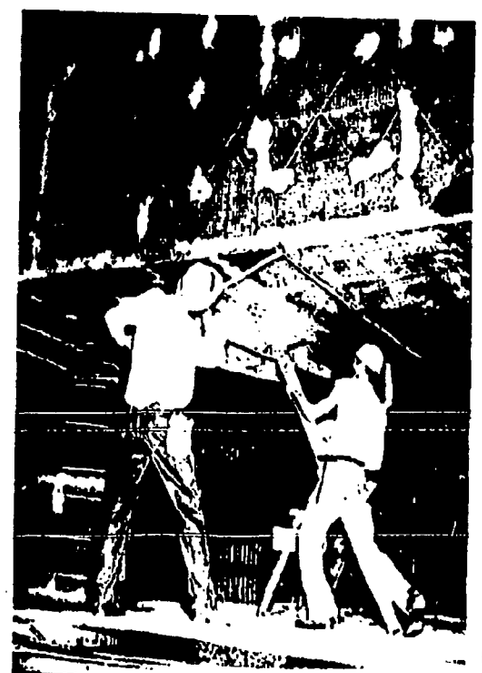

...en Aerial view of the Memphis sta... just after the first unit went into ...ation. All three are now on line

Fig. 1. Metal finish applied over insulation on underside of recirculating gas duct. Background: Tubes of Unit 2





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Fig. 4. Ease of handling is demonstrated as insulating block is cut to conform with either a curved or irregular surface

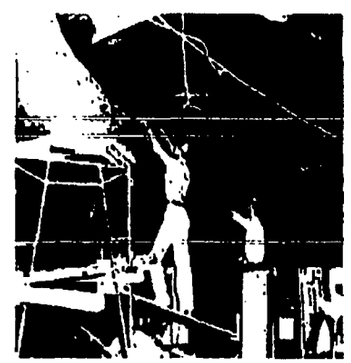

Fig. 5. Beveled edges, cut with small table saw, make tight-fitting coat for cylindrical surface of a 30-in. downcomer



Fig. 6. (Above) Insulating block wired directly to cyclone riser tubes simplifies tough job, cuts cost considerably



Fig. 7. Road mesh is welded to flanges and stiffeners on boiler flue recirculating outlet in preparation for installing two layers of insulating block

is illustrated in the photographs showing the application to the furnace wall. The pressurized boilers have a 16-ga steel inner casing to which ¼-in. self-welding stud washers were welded in the shop. These washers, spaced at appropriate intervals on the exterior of the casing panels, served as anchor points for the 14-ga galvanized steel tie wires, which hold the insulation in place.

To secure the block insulation, two tie wires were looped through each stud washer, and both ends of each wire were brought through a hole over all four protruding wires; the wires were stretched over the surface of the insulation, tied, and twisted tight to adjacent lacing wires in a diamond pattern, Fig. 3. The washers prevent the wire from cutting into the block at the points where they emerge on the surface of the insulation. The studs welded to the casing were located so that each separate block was crossed by at least two wires.

When two layers of insulation were required, both were impaired upon the wires before the lacing wires were tied across the surface. Of course, when the two layers were applied, the joints between the blocks of the second layer were staggered with respect to those of the first layer.

Thickness of block insulation, applied to flues and ducts at the Thos. H. Allen Electric Generation Station, was determined by the maximum temperature of the gases carried, according to the schedule at the top of the next column.

Maximum Temperature, Degrees F	Block Thickness, Inches
350	1
450	1½
500	2
550	2½
600	3
700	3½
800	4
900	4½

Because of its resilience and workability, the mineral-wool block was also easy to install on the unit's cylindrical ducts. By making a bevel cut lengthwise through the block, Fig. 5, and then reversing one of the two pieces and butting the beveled edges, an approximate radius was formed. Depending on the diameter of the surface in question, curvature could be made to correspond very closely to that of the duct. The inherent resilience of the block did the rest, making a snug fit with the cylindrical surface.

At Memphis the lengths of beveled block were then held temporarily in place on the cylindrical surface with oversize "rubber bands," made from old inner tubes, until they could be permanently bonded with ¾-in. steel bands and clips, Fig. 6. As on the flat surfaces, all joints and voids between blocks were then filled with B-E-H No. 1 Insulating Cement to complete the thermal seal, Fig. 7.

Method of applying the block to the rectangular flues and ducts differs from that [illegible] on the furnace wall only in the [illegible] in which the tie wires are [illegible] to the duct surface. Here, unlike [illegible] securing the wires directly to the [illegible] being insulated, they are [illegible] to a course of 4 by 4-in., 8-ga road mesh welded to the flanges and stiffeners, and bridging the gap between these projections, Fig. 8. Thus the block could be laid to give a smooth, flat outer surface with no special treatment required for covering the flanges or stiffeners to give the specified insulation thickness.

Because of its workability, Mono-Block could also be used, instead of molded pipe covering, to directly insulate various tube bundles. By wiring the block directly to the tubes themselves, a snug thermal barrier was created without the need for a special material.

Although the furnaces are housed, flues, air ducts, and the air preheater are located outside the building. In order to prevent accumulation of standing water, the insulation and its protective metal covering on the top horizontal surfaces are sloped downward, ¼ in. per ft, from the centerline of the duct. This is accomplished by sloping the road mesh base, to which the insulation is attached, when welding it to the duct. The standing seams in the metal lagging finish on these surfaces run parallel to the slope.

For maximum protection against moisture or accidental damage, as well as for an attractive finished appearance, all insulated surfaces are finished with metal lagging. The penthouse roof is lagged with 16-ga roof decking having 2½-in. ribs. Other surfaces are finished with either 18-ga flat sheet metal or the ribbed roofing. Lagging is secured to the clips which protrude the insulation. THE END

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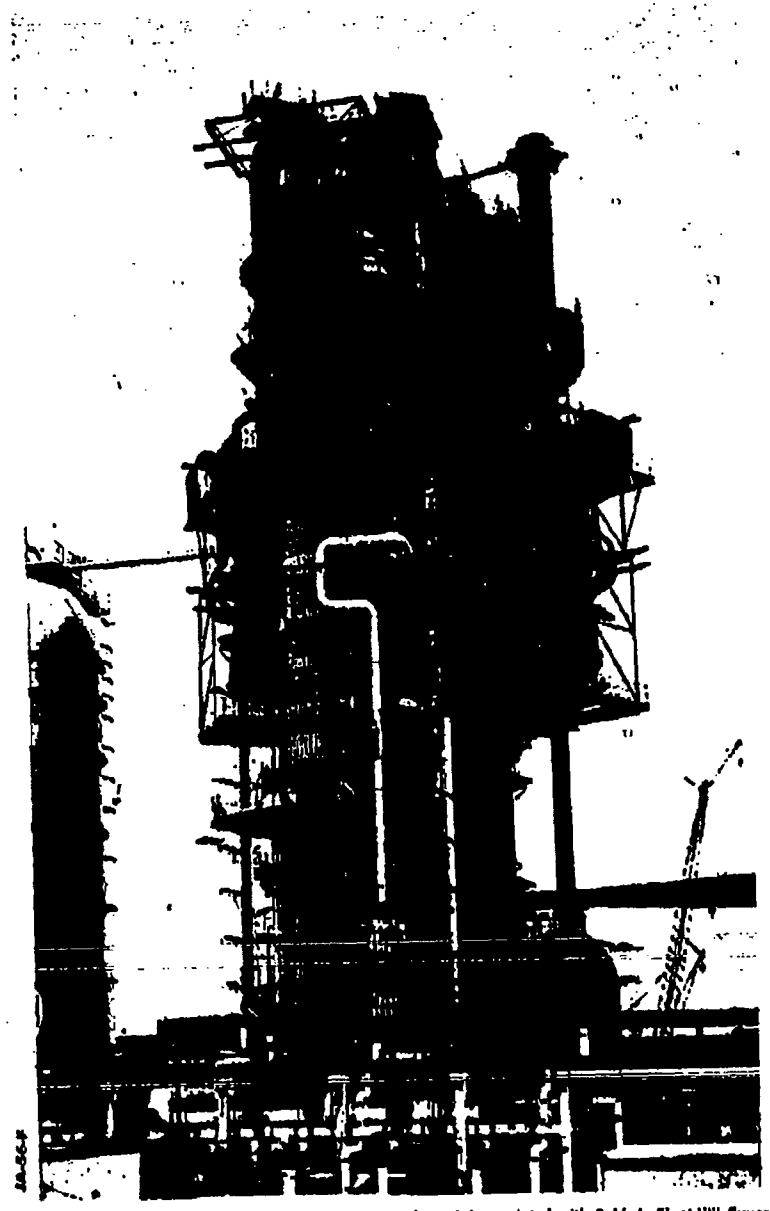

Baldwin-Ehret-Hill Mono-Block installed on giant catcracker. Joints pointed with Baldwin-Ehret-Hill Super Powerhouse Cement.

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