Babcock & Wilcox
Refractories Division

Hazardous material file

Product Information

APPLICATION - KAOWOOL

Ferrous Heat Treating/Stress Relieving (Pipe Welds)

A reuseable Kaowool ceramic fiber blanket insulation for code weld heating has been shown to cost 75% less to use than asbestos, in a field trial on a large boiler erection job. The blanket was used for the stress-relieving of more than 40 welds on pressure piping for the boiler's steam circulation system, and was found to more than repay its higher first cost through multiple reuse, and to cut installation time from more than an hour to a few minutes. The blanket creates additional savings through prolonging the life of induction cable insulation, and there are immeasurable but definite savings from elimination of the nuisance of disintegrated asbestos.

The blankets are made by the Refractories Division of The Babcock & Wilcox Company, of its Kaowool ceramic fiber blanket jacketed in Inconel mesh. The Kaowool blanket is an inch thick and thus eliminates the cutting and wrapping of many individual layers necessary when asbestos is used. This creates the labor saving. Kaowool alumina-silica ceramic fiber can withstand continuous exposure to temperatures as high as 2300°F and thus is not disintegrated by the temperatures involved in preheat and stress relief, so that it can be reused many times. This creates the materials cost saving.

The trial was made by the Boiler Division of The Babcock & Wilcox Company, on the erection of a sub-critical 2,600,000 lb./hr. Universal Pressure boiler. A large job such as this justifies the installation of a propane distribution piping system, and so propane was used to provide heat for all weld pre-heating and for stress relieving of small-diameter welds. But most welds of 8-inch pipe and larger were stress-relieved by induction heat, and utilized the jacketed Kaowool fiber blanket.

In contrast to asbestos, the jacketed Kaowool fiber blanket can be handled in a length sufficient to permit continuous wrapping around pipe of any diameter. Winding it around, and tying it with two asbestos straps, takes two men about five minutes. Removal is equally quick, and the blanket does not deteriorate after one use, its life being limited only by the slow accumulation of wear due to repeated handling.

The jacketed Kaowool blanket can be used in rain or snow, while asbestos is so fragile that it must be handled with great care even nnder the best of conditions because soaking rain or melting snow makes the material lose strength and become virtually impossible to handle.

Normally, the welding supervisor on the job would have specified 1/8-inch asbestos roll board to wrap the weld area before winding on the induction heating cables. An inch of insulation is standard, requiring the cutting, wrapping, and tying of eight separate layers of roll board since the material is too fragile to permit simply wrapping a long length around eight tim.

Considering the complication involved when there is a valve or other fitting near the weld, as is common, this installation of insulation takes two men an average 1-1/2 hours. The heat affects the asbestos board material so that when stress relief of a weld is completed, it disintegrates as it is peeled off, often raining down through gratings causing workmen below to leave their work and move out of the way.

The bare copper induction cable conductors are insulated with a woven asbestos sleeve or sock, which deteriorates with repeated handling and requires periodic replacement. Overheating accelerates this deterioration and means more frequent replacement. The superior insulating value of the Kaowool blanket protects the sock material from overheating, and was found to thus prolong its life several times over that experienced when asbestos is used to wrap the weld area.

The blankets used in this field trial were 7 feet long and 24 inches wide. This width proved adequate for the 10-14 turns of induction cable usually applied for stress relief. The full seven feet of length was, of course, not required for pipe diameters as small as 8 inches; the excess length was simply wrapped as additional layers on the pipe. Based on experience gained in this and other field trials, standard blankets are now offered by Babcock & Wilcox in a Weld Insulation Kit consisting of a roll of 24 linear feet of jacketed blanket, 24 or 48 inches wide. Lengths can be cut as needed from the roll to suit different pipe diameters; the package includes a "sewing kit" for closing the mesh jacket at cut ends. Although in normal practice a length of less than 7 feet would have been cut for stress relieving welds on an 8-inch pipe, the accompanying cost analysis has been based on the 7 x 2-foot blanket actually used in the field trial: a total of 14 sq. ft.

The Kaowool blankets showed a life of at least 14 weld stress relief uses, so the consumption is one sq. ft. per weld. An 8-inch pipe would require approximately 18 linear feet of asbestos roll board to build up eight layers. Board width is also 24 inches, for a total of 36 sq. ft. A typical 1/8-inch roll board weighs 64 lb./100 sq. ft., giving a requirement of 23 lb./weld. This is the actual consumption of roll board per weld since the material cannot be reused.

Asbestos sock for insulation of 500 MCM cable runs about 8 ft. /lb. Cables are 50 feet long, and two are used for each stress relief job. When Kaowool blanket is used, the sock lasts for an average of seven welds before it needs replacement, for a consumption of 14.3 feet, or 1.8 lb., per weld. Life when stress relief temperature is 1350°F averages two welds when the pipe is wrapped with asbestos, and 3-4 welds at the more common temperature of 1150°F. An average life of three welds was used for the cost analysis, a consumption of 33.3 feet, or 4.17 lb., per weld.

In the analysis only installation labor is considered. Less time is required to remove the reuseable blanket than asbestos, but this is largely offset by time spent in removing the blanket to a safe place pending its next use.

The cost analysis, for an 8-inch pipe, shows cost for insulation, when Kaowool jacketed fiber blanket is used, to be nearly 1/4 the cost of using asbestos. An additional few cents in saving could be included since 16 asbestos ties are required to secure the eight asbestos layers, versus two ties for Kaowool blanket. More important is the fact that savings are greater for larger-diameter pipe, since such pipe could be insulated by the same Kaowool blanket but would require more asbestos for its greater diameter.

COST ANALYSIS

Jacketed Kaowool Fiber Blanket vs. Asbestos Roll Board
to Insulate 8-Inch Pressure Pipe for Weld Stress Relief

	Requirement/Weld	Cost Basis	Kaowool Ceramic Fiber	Asbestos
Insulation Material				
Kaowool	1 sq. ft.	$5/sq. ft.	$ 5.00	
Asbestos	23 lb.	30¢/lb.		$ 6.90
Installation Labor				
Kaowool	0.2 man hours	$9/hour	1.80	
Asbestos	3.0 man hours	$9/hour		27.00
Cable Insulation Sock				
Kaowool	1.80 lb.	$1.85/lb.	3.33	
Asbestos	4.17 lb.	$1.85/lb.		7.70
Cost to insulate weld on 8-inch pipe for stress relief:			$ 10.13	$ 41.60

Workmen wrapping jacketed Kaowool ceramic fiber around boiler superheater supply crossover, before installing induction cable for code pressure weld stress relief. The two men can install this blanket in five minutes. Wrapping and tying layers of 1/8-inch. asbestos took two men an hour and a half. While asbestos is not reuseable, this blanket had already been used seven times, will be useable for about seven more welds.

Bending a sheet of asbestos roll board around a downcomer shows its stiffness, the ease with which it tears, and the difficulty of fitting it to projections on the pipe. Eight layers of asbestos have to be individually cut, wrapped, and tied, to build up the requisite thickness for insulation during stress relief. Soaked asbestos cannot be handled without disintegrating, so work must stop or shelter be erected if heavy rain occurs.

Workmen coiling induction cable around crossover pipe insulated with jacketed Kaowool blanket. When this blanket is used, asbestos sleeve insulation on the cable lasts longer, because the high insulating value of the blanket protects the asbestos from excessive heat. Two 24-inch wide blankets are being used here.

Metal temperature under blanket is 1100°F as blanketed weld is being stress-relieved but technician can put his bare hands on the exterior of the blanket. Field trial of new blanket showed it does not require elaborate tying, as asbestos did, to prevent it or the cables wrapped around it, from "walking" down vertical or nearly-vertical pipe. Blankets used in field trial had a hole near one end to fit over thermocouple well, such as the one visible at top, center.