THE DOW CHEMICAL COMPANY

MIDLAND DIVISION
July 28, 1969

JMB Please copy for MTBudley
also attach to my copy of insulation writing

PLAINTIFF'S EXHIBIT
DOW-197

→J. M. Scovic

cc: R. G. Carlson
D. D. DeLine
A. C. Wilcox

INSULATION MATERIALS

The Productivity Committee has reviewed your letter of July 24 with the attachments that outlined some of the economic considerations comparing Aircell asbestos insulation with Fiberglas.

It is clear that we have not only a significant safety advantage with Fiberglas but an economic advantage as well. We strongly support your pursuing the necessary communication program within the Maintenance organization that you suggest and taking positive action steps to discontinue the use, wherever possible, of asbestos insulation.

W. H. Fletcher

W. H. Fletcher
For the Productivity Committee

dmf

↑file

ST0000302

DOW 00098

THE DOW CHEMICAL COMPANY

MIDLAND
July 24, 1969

J. M. Scovic
Manager of Services
47 Building

INSULATION HAZARDS AND MATERIAL REVIEW
(ECONOMIC PHASE)

The prime objective in developing our program on insulation hazards and materials has been to correct a potential safety hazard we may have.

Attached you will find an economic analysis. This analysis is in much greater depth than we intend to present in our communications program as part of the formal agenda. This economic information has been gathered mainly for background information and will be used to answer economic questions which I am sure will arise. I might at this point say a few words about the attached exhibits.

Exhibit I is a letter written by Roy Anderson which is intended to be mailed out to the production representatives after they have attended our communications meeting. The objective of this letter is to reinforce our opinions on the merits of the various insulation materials.

Exhibit II is a simplified, straightforward, hypothetical cost comparison.

Exhibit III is the backup data used to develop the figures in Exhibit II. We have a factor in the economics of comparing insulating materials which we have previously not examined closely which is the thermal conductivity coefficient. The k factor for Aircell is .61 while the k factor for Fiberglas is .29. Over the years Aircell insulation has been grossly misapplied. The top temperature limit for Aircell is 200°F. In order to have a working system we have found that additional steps have been taken to make up for this thermal conductivity coefficient deficiency. One that is commonly used is the wrapping of the pipe and tracer with aluminum foil prior to installing the Aircell. A second method which is commonly used is applying Thermon heat transfer cement on the tracer to more evenly distribute the heat. By using the proper insulation such as Fiberglas, the need for these extra steps could be eliminated. The cost of these extra steps certainly must be taken into consideration when comparing Fiberglas and Aircell insulation.

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Exhibit IV simply states the volume of Aircell insulation used. The latest figures available are for the year 1967. However, the insulation material costs are the current costs. It is undetermined at this time whether an increase in the volume of purchase of fiberglas would qualify Dow for a lower per unit cost.

Exhibit V, which is an analysis by Roy Anderson, states the steam cost penalty we pay for under insulating when Aircell insulation is used without a backup of either aluminum foil or thermon.

Our estimates do not include the additional cost of the safety precautions we will have to take to protect our people against the asbestos hazards connected with Aircell. We estimate an additional 20 minutes per day will be diverted away from the productive portion of a job into the safety portion of a job due to the use of respirators. This amounts to an additional cost of roughly $58,000 on an annual basis. The purchase of the respirators themselves and the replacement cartridges will add another $4,000 annually.

Shower time will not be automatic when insulators install Fiberglas. The Foreman on the job will use his discretion with the insulators as he does with the other craftsmen as to when shower time should be recommended. I am sure that the cost of shower time will diminish as Fiberglas becomes a more accepted insulation material.

Following is a combination of the data shown in Exhibits II and V reflecting the most extreme conditions. The example was to insulate 200 feet of traced pipe:

Fiberglas insulated	$506
Aircell insulated	$442
One shot savings on insulation costs	$ 54
Steam cost increased $23 per year	
Return on investment 42.6%	

I believe first and foremost from a safety standpoint that it is imperative that we change our insulation practices. I believe from an economic standpoint the overwhelming use of Fiberglas insulation throughout the country would certainly indicate an economic benefit will be gained from using it.

I would like at this point to express my appreciation for the assistance that Larry Warren and Roy Anderson gave in developing the attached data. I think these are two professionals that we can truly be proud to have within our organization.

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Please feel free to contact me on any further questions you may have.

T. J. Madden
Maintenance Manager
Agricultural Chemicals Production
Organic Chemicals Production
222 Building
Phone 6-2225

TJM:rb

Enc.

ST0000305

INSULATION

ECONOMIC ANALYSIS

AIRCELL VS. FIBERGLAS

EXHIBIT I	Roy Anderson's letter to Plant Supervision on insulation alternates and applications
EXHIBIT II	Summary of comparative insulation costs on a hypothetical job
EXHIBIT III	Detailed labor and material cost comparisons
EXHIBIT IV	Aircell insulation usage and material costs of Aircell vs. Fiberglas
EXHIBIT V	Theoretical heat loss comparison between Aircell and Fiberglas insulation

ST0000306

THE DOW CHEMICAL COMPANY

MIDLAND
July 24, 1969

INSULATING MATERIALS AND ALTERNATES

We are principally concerned in this discussion with materials which may be substituted for some of our existing asbestos-containing insulation and how this will affect us economically.

The use of Aircell pipe insulation should be eliminated from the plant. It should never be used in any application over 200°F. and then for personnel protection only. It has a K factor of .61 as compared to .29 for Fiberglas. Fiberglas is about 25% more expensive to purchase; however, if aluminum foil is used with Aircell, as is the case many times, it is questionable whether one is more expensive than the other. (See table of estimated costs attached.) Temperature wise, Fiberglas is recommended up to 400°F. It is available either plain or with a number of factory applied jackets, some of which are self-sealing. Ordinarily, we would cover the plain Fiberglas insulation with the same JM paper that is now used over Aircell. It is necessary to wire the paper onto Fiberglas inasmuch as staples will not hold. This procedure makes the process slightly more time consuming than with staples.

A completely dry piping system can be made up by using wedges of Fiberglas blanket for ells and fittings and covering these with preformed fittings of PVC. A waterproof tape can be used to seal the joints.

In the temperature range of 400° to 1200°F., calcium-silicate is still the standard insulating material. As a substitute, we are presently making a survey of Careytemp 1500. This is an expanded silicon (perlite) material with a temperature range up to 1500°F. It does not absorb water and has a very low chloride content. At the present time it contains about 6% asbestos; however, in the near future it may be available in an asbestos-free form. The K factor is almost identical to calcium-silicate.

Another alternate material for temperatures up to 800°F. is cellular glass. This material is more expensive than calcium-silicate and should be used only where its special properties merit the extra cost. It is more dense than calcium-silicate and non-absorbent. This property makes it especially valuable where there is danger of autoignition. It is ideal for dual temperature vessels or pipelines. The material is easily worn away by abrasion and for this reason tank heads should be adequately protected. Glass cloth imbedded in epoxy resin is excellent for this purpose.

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The material is available in preformed sections for both pipes and tanks. The K factor is very similar to calcium-silicate. The Dow Chemical Company has only recently entered this field with a material called Ceramic Foam.

If you have any questions or want further information on insulation, please feel free to contact me.

Roy Anderson
Maintenance Engineer
ACP & OCP Maintenance
222 Building
Phone 6-4456

rb

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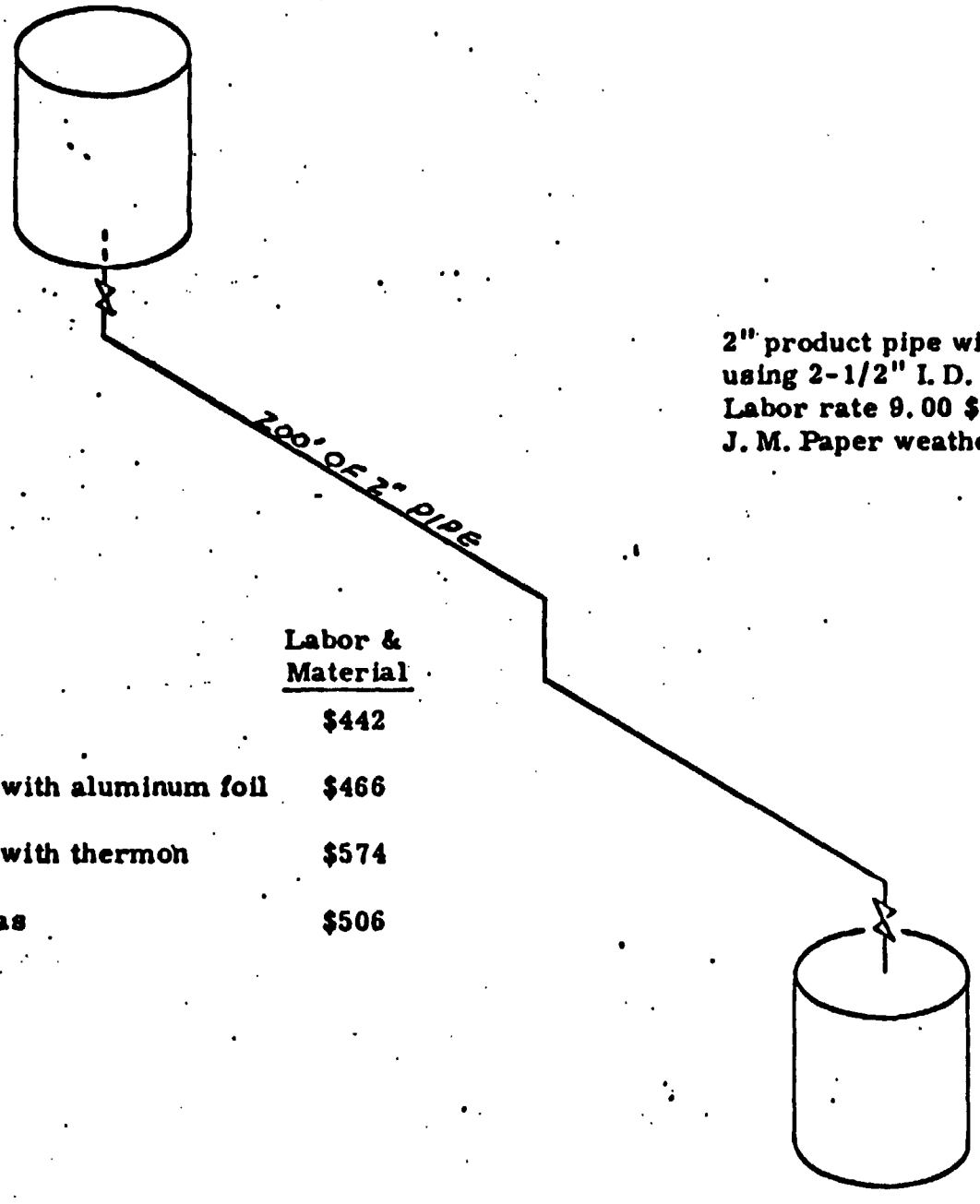
EXHIBIT II

HYPOTHETICAL COVERING JOB

ST0000309

DOW 00105



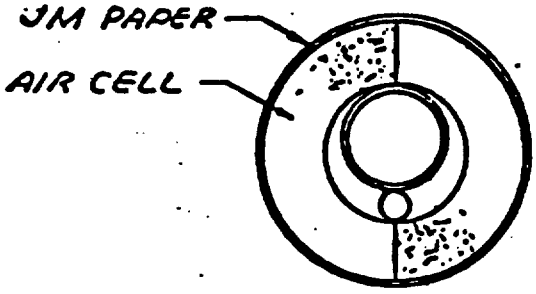
2" product pipe with steam tracing
using 2-1/2" I. D. insulation.
Labor rate 9.00 $/hr.
J. M. Paper weather proofing

	Labor & Material
Aircell	$442
Aircell with aluminum foil	$466
Aircell with thermon	$574
Fiberglas	$506

EXHIBIT III

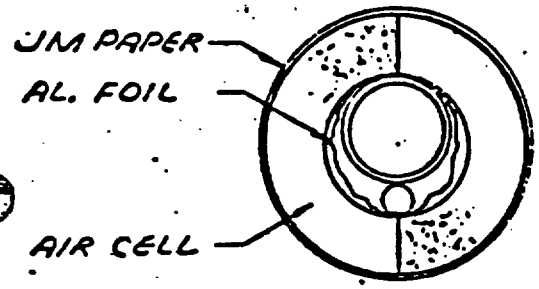
INSULATING A 2" PIPE SYSTEM PER FOOT

AIRCELL



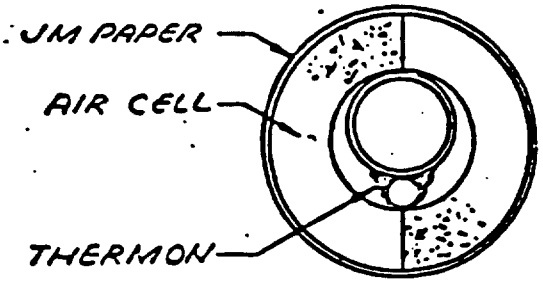
Material:	(Aircell	$ .29 per ft.
	(J. M. Paper	.30 per ft.
		$ .59 per ft.
Labor:	(Aircell	$ 1.50 per ft.
	(J. M. Paper	.12 per ft.
		$ 1.62 per ft.
Aircell total cost:		$ 2.21 per ft.

AIRCELL WITH ALUMINUM FOIL



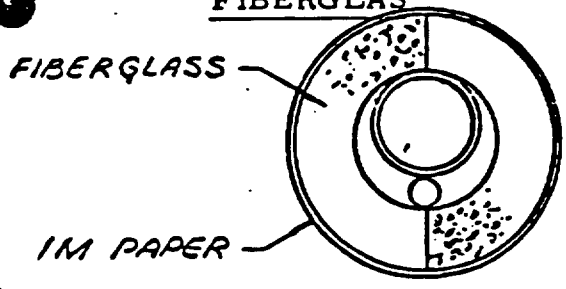
Material:	(Aircell	$ .29 per ft.
	(J. M. Paper	.30 per ft.
	(Aluminum foil	.09 per ft.
		$ .68 per ft.
Labor:	(Aircell	$ 1.50 per ft.
	(J. M. Paper	.12 per ft.
	(Aluminum foil	.03 per ft.
		$ 1.65 per ft.
Aircell with aluminum foil total cost:		$ 2.33 per ft.

AIRCELL WITH THERMON



Material:	(Aircell	$ .29 per ft.
	(J. M. Paper	.30 per ft.
	(Thermon	.40 per ft.
		$ .99 per ft.
Labor:	(Aircell	$ 1.50 per ft.
	(J. M. Paper	.12 per ft.
	(Thermon	.26 per ft.
		$ 1.88 per ft.
Aircell with thermon total cost:		$ 2.87 per ft.

FIBERGLAS



Material:	(Fiberglas	$ .43 per ft.
	(J. M. Paper	.30 per ft.
		$ .73 per ft.
Labor:	(Fiberglas	$ 1.50 per ft.
	(J. M. Paper*	.30 per ft.
		$ 1.80 per ft.
Fiberglas total cost:		$ 2.53 per ft.

*J. M. Paper wired on Fiberglas vs. stapled on Aircell

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EXHIBIT IV

COMPARATIVE INSULATION MATERIAL COSTS

Size (inches)	1967 Usage of Aircell (feet)	1969 Prices (per ft.) Aircell	Fiberglas
1/2	400	$ .18	$ .28
3/4	1500	.19	.31
1	4000	.22	.34
1-1/4	6000	.24	-
1-1/2	9000	.26	.40
2	11000	.29	.43
2-1/2	20000	.32	.46
3	6000	.36	.50
3-1/2	3500	.40	.55
4	3000	.48	.65
5	2500	.56	-
6	7000	.64	-
8	4000	.88	1.46
4-1/2	3000	.52	.69
12	1500	1.48	-
7			1.18

82,400' of Aircell used in 1967

TJM
7-24-69

S10000311

EXHIBIT V

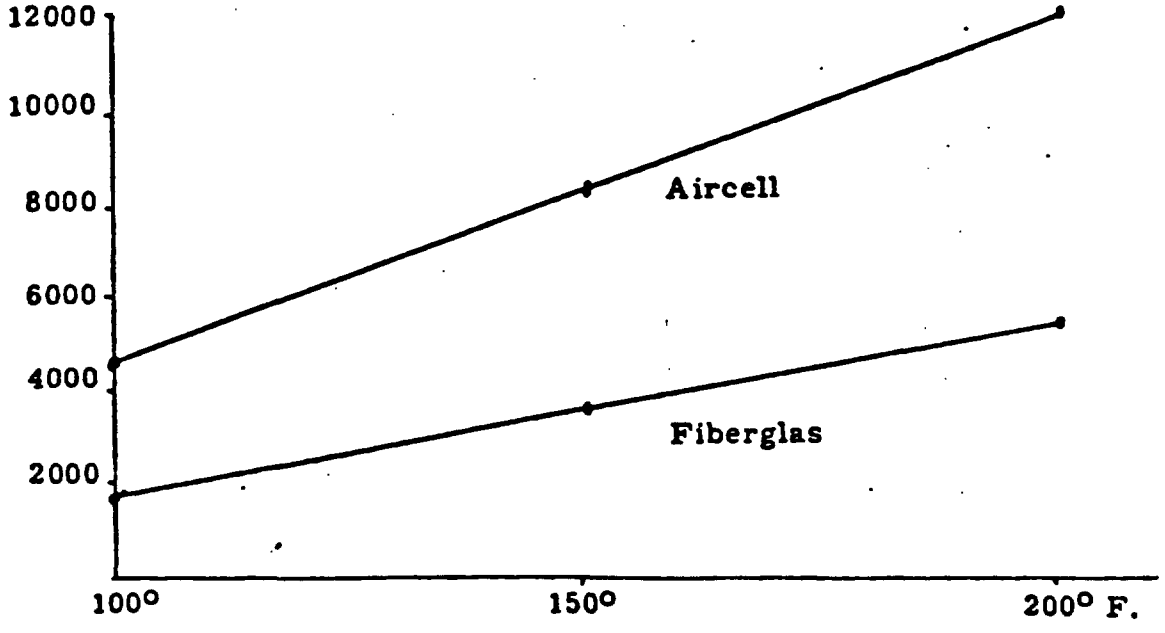
THEORETICAL HEAT LOSS COMPARISON BETWEEN AIRCELL & FIBERGLAS INSULATION

Conditions: 3/8 inch tracer with 150# steam on a 2 inch product line 200 feet long. Insulation thickness 3/4 inch

Assume: That heat from 1/2 of the area of the tracer is absorbed by the product and heat from the other half goes to ambient (70°F.) thru the insulation.

Equation: $$Q = \frac{k A \Delta t}{\Delta x}$$

where: Q = BTU/hr. heat loss
k = Thermal conductivity
A = Area of pipe surface
Δt = Temperature difference between tracer (370°F.) and surfaces being heated.
Δx = Insulation thickness in inches



At a product temperature of 150°F. the heat loss difference between Aircell and Fiberglas is about 4500 BTU/hr. per 200 feet 2 inch line. This represents 3.75 lbs. of steam/hr. or $23 per year.

DOW 00108

Roy Anderson
ACP & OCP Maintenance

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