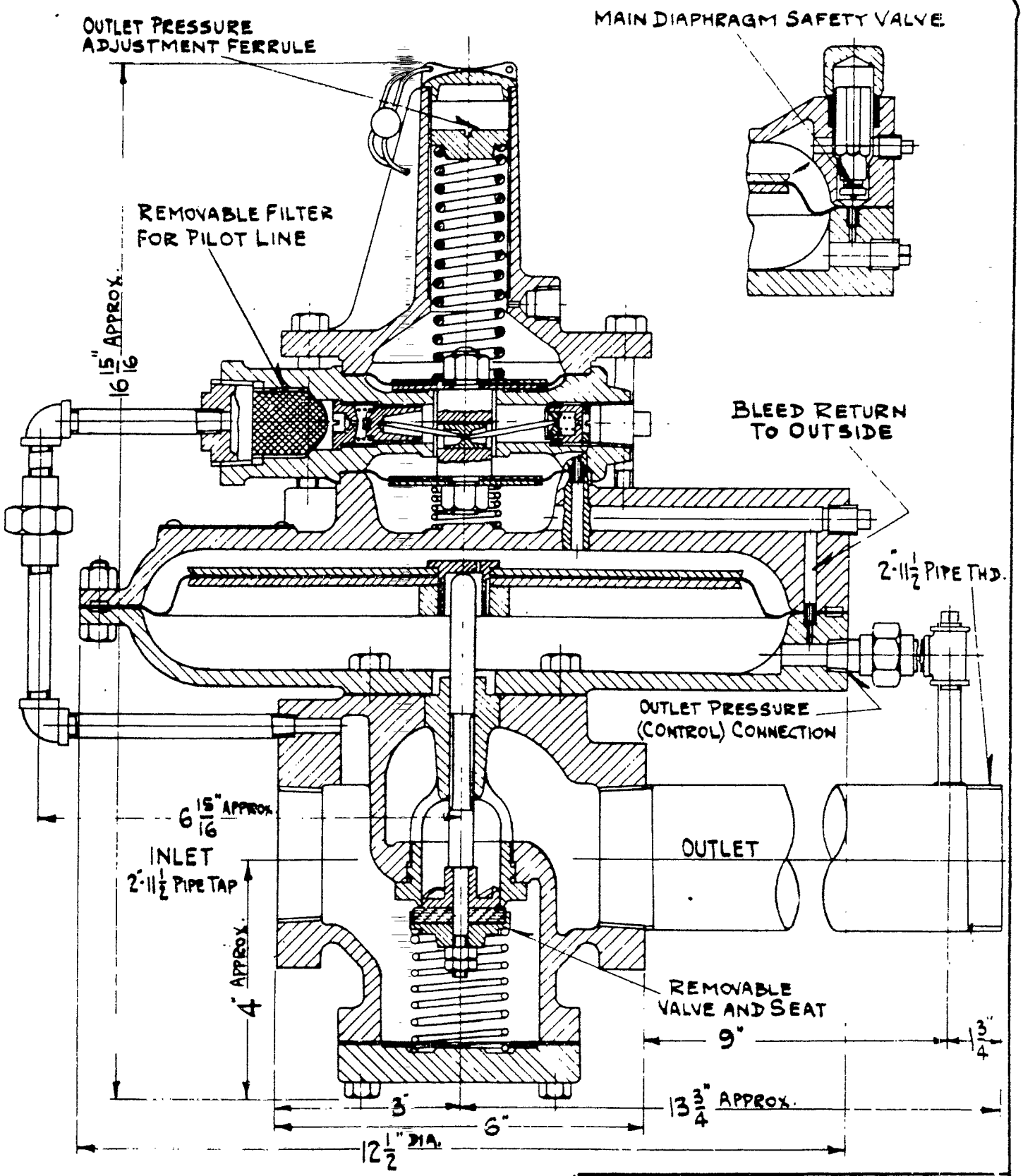
PLAINTIFF'S EXHIBIT

CHV-680

05-216 Recommission Houdry Compressor Speed Controls

Chevron BB
012531



PITTSBURGH EQUITABLE METER CO., PITTSBURGH, PA.

EMCO 1001 REGULATOR

DATE ISSUED	DWG NO
	M-7284-1

Customer: Catalytic Construction Co.
Contract: 5174 - Cust. Order: SO-TEX 3405-J
PTG-E-3405-J-2-R

19-218

Chevron BB
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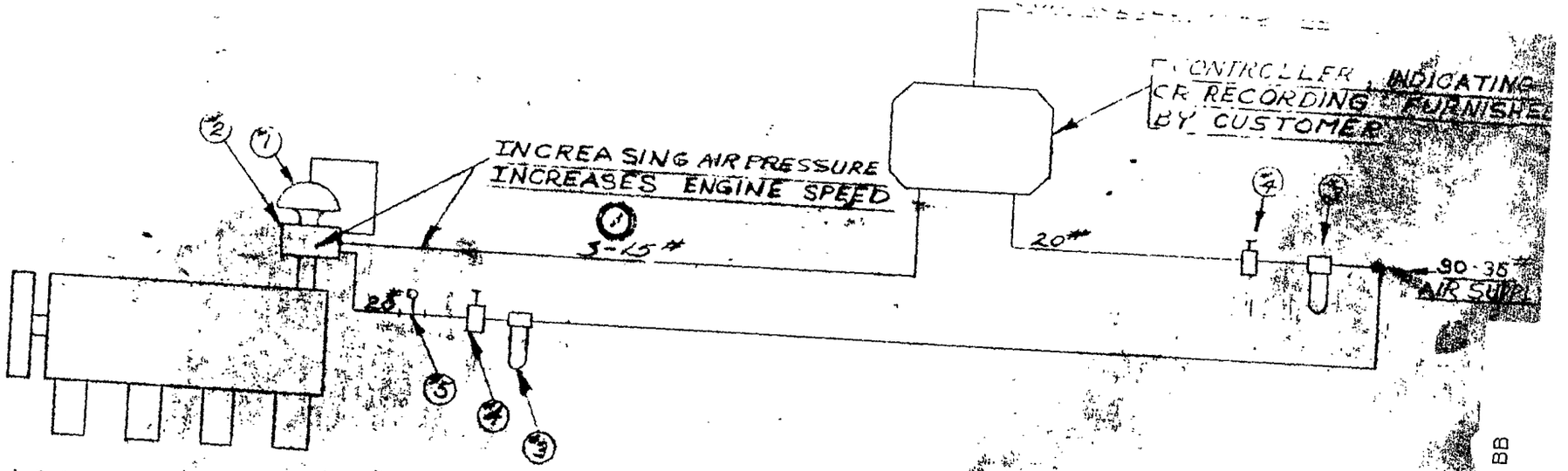

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ITEMS - K-501, K-502, K-503

REQ. NO 1405-K-1

CATALYTIC ENGINE PRINT FIG-K-1405-1

ITEM #1 - AIR MOTOR
#2 - PRECISOR
#3 - DRIPWELL AIR FILTER
#4 - REDUCING VALVE
#5 - 2" DIAL PRESSURE GAUGE

ITEMS #1 TO #5 INCL. FURNISHED BY CLARK BROS. CO.
ALL PIPING FURNISHED BY CUSTOMER

ALTERATIONS	BY	DATE
WAS 1-16" DC ADDED 1"		

PART No.

MATERIAL

ALL FRACTIONAL DIMENSIONS HAVE A ± .010" TOLERANCE UNLESS OTHERWISE PRESCRIBED

f1 ROUGH MACHINE FINISH
f2 SMOOTH MACHINE FINISH
f3 GRINDER FINISH

TYPICAL SPEED CONTROL DIAGRAM FOR GAS ENGINES

TYPE

DRAWN BY JS 11-15-51

TRACED BY

CHECKED BY HE 11-15-51

SCALE

CLARK BROS.

E-701

MEMORANDUM

El Paso, Texas
February 8, 1954

Lubrication of Cracking
Area Equipment

MR. E. C. HURT:

In this memo I will outline the steps taken to provide adequate lubrication for the numerous and varied types of equipment being operated in the Cracking Unit area.

The Cracking area equipment was placed in service during the latter part of October 1952. From that time until the present I can think of no equipment failure that can be specifically charged to the use of improper type of lubrication.

A survey of all the mechanical equipment installed in plants 2, 3, 4, 5 and 6 was made by Mr. W. W. McCutcheon and W. T. Peoples. These men were selected to make this study because they are recognized to be the authority on all types of lubricating problems for the Standard Oil Company of Texas. Mr. McCutcheon is Fuels and Lubricants Engineer for Standard of Texas.

From this survey the lubrication requirements were tabulated and presented to the Standard of Texas Manufacturing Department by a letter of transmittal, dated October 7, 1952. As stated in this letter, one of the principle objectives in making lubrication recommendations is to keep the number of products in use at a minimum.

Since this survey was made, numerous informal discussions have been held regarding the lubrication problems encountered. The problems have been presented to Mr. McCutcheon and his recommendations have been followed. When a major piece of equipment or one presenting a lubricating problem is down, an attempt is made to contact him for his opinion. If available his personal inspection is requested.

Included in this category is the lubrication of Clark Gas Engines and Wet Gas Compressors. For the lubrication of these machines, three types of lubricating oil was recommended. Three different problems are encountered in the proper lubrication of these engines.

The duties are tabulated as follows:

Multiservice 65K 1. Lubrication of power cylinders, scavenger cylinders and crankcase.
Manna 88K 2. Lubrication of compressor cylinders, packing glands and rods.
Turbine 61#9 3. Flushing of compressor cylinder piston and valves.

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For item 1, Calol Multi-Service Oil 65X was selected and is still being used satisfactorily. This is proven by the micrometer measurements of power cylinder pistons taken when the compressors were down during the last major shutdown. These showed that the sizes were still within the manufacturer's tolerances, after almost a year of operation.

For item 2, Calol Turbine Oil 19 was recommended during the survey but with some apprehension. This oil was an alternate choice made at the behest of California operators, resulting from difficulties previously experienced by them in meeting a bloom specification of gasoline. We used Turbine Oil 19 during the first operating period. During the first shutdown measurements of rod wear were taken. It was found that wear rates on compressor rods were excessive. Reduction in rod size as much as .042 of an inch was found. For this reason the lub. oil used in this service was changed to 38X, an oil containing a small percent of Rapeseed oil. This is recommended in the Clark Manual. Rapeseed is recognized to be very effective in providing an oil film that is not readily washed from the cylinder walls and rods by the wet gas being handled.

For Item 3, Calol Turbine Oil 9 was selected. This oil has a very important function to perform. Its main requirement is one of flushing. It must be used in sufficient quantity to provide a flushing medium to prevent the reaction of Hydrogen Sulphide with the iron of the compressor. An oily film must be provided to prevent the formation of iron sulfide encrustation on the piston. The following is quoted from the Clark Manual: "A number of compressors operating in refineries are successfully handling gas which would wear cylinders excessively under ordinary conditions, by flushing four to six gallons of gas-oil per day through each compressor cylinder. This usually is accomplished by feeding the oil into the suction line, close to the cylinder."

6x9=54gpd
x .50
$25
x 365 d.
$9100
36 to 54gpd flushing oil

The use of gas oil or kerosene for flushing was discussed with Mr. McCutcheon. He advised against its use because of its deficiency in lubricating ability.

The quantity of flushing oil to be used remains a problem. The reason being that we are required to adjust the flushing oil rate and then operate for periods of quite long duration, then inspect the compressor pistons, cylinders and valves for damage before making further reduction in quantity of flushing oil being used.

The oil used, Turbine Oil, does not have the O. C. title because the oxidation corrosion inhibitors which add to the cost of the oil have not been added. These inhibitors are not necessary in a service of this kind because the oil does not remain in the engine for long enough periods to be converted to an oxidizing or corroding material.

Turbine Oil 9, although selected because of lower price, adds measureably to the cost of lubricating the compressors because of the large quantities required. When included in the overall lub. oil picture of compressor operation, it presents a very unfavorable Brake Horsepower hour per gallon of lubrication oil picture.

Reductions in the quantity of flushing oil being used are being made as rapidly as can be done without subjecting the equipment to the possibility of serious damage because of deficient flushing oil. Studies are now being made to provide a more accurate method of accounting for all types of oil now being used in the compressors.

A discussion regarding the possibility of switching the compressor lubrication to one type of oil was held by Mr. McCutcheon, Mr. W. H. Hudson and myself. The use of only one type of oil has advantage in storage handling and reduces the amount of equipment needed in handling.

The decision resulting from the discussion was to the effect that we should continue to operate the compressors with present oils being used. We would reduce the quantity of flushing oil used in small increments and make periodic inspections to be sure that compressor damage did not result.

The reasons for this decision were that:

1. When crankcase and power cylinder lubrication only were used in determining BHP per ~~H. hour~~ gal. of lubrication, we are not far from the accepted 3200 H. hours per gallon. An accurate figure for this is not available because accurate lub. oil records and operating time are not available. Steps are being taken to make these available.

2. Excellent condition of power cylinder, pistons and rings indicate proper lubrication is being practiced. If either too much or too little oil was being used, thepistons and rings would certainly show the trend. McCutcheon made the remark that he had never seen power pistons anywhere that were in better condition.

3. We recognize the fact that a change from thepresent satisfactory type of lubrication could possibly cause serious damage and possible shutdown of a compressor if tried on only one and possibly on all if applied to all. We also know from experience that the loss of a compressor requires drastic reauction in feed rates. With each shutdown, for periods of longer than just a few minutes, we have been required to reduce feed rate as high as thirty percent to be able to handle the gas properly while a compressor is off the line.

Considering the possible loss of feed entailed by damage to a compressor, we prefer to continue the present lubrication practice until a spare compressor is available for use in the event a shutdown caused by damage during the test becomes a reality.

There is no question that our whole lubrication system not alone in the new equipment but throughout refinery could be improved upon. The improvement required takes the form of storage, heating, receptacle, cleaning, and distribution. Our lubricating bills are certainly higher than they

should be because of the failure to provide means to keep the oil barrels, cans and buckets dirt proof. We hope that the oil storage to be provided at the compressor house will help to alleviate the situation in plants 2, 3, 4, 5 and 6. Other small installations are to be provided in the Thermal Cracker, Gas Oil and Naphtha Rerun area. One on top of the structure to keep dust out of the oil is being considered as is a small shelter for oil used in the carrier compressor at the Alkylation area. These various additions will certainly reduce waste and loss of oil because of contamination and will contribute to more efficient lubrication of the equipment.

P. P. MUSTAIN

PPM:hb

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