Laboratory Measurement of Sorption in Porous Media

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By
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I certify that I have read this report and that in my opinion it is fully adequate, in scope and in quality, as partial fulfillment of the degree of Master of Science in Petroleum Engineering.

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Abstract

Adsorption is increasingly being acknowledged as a storage mechanism in vapor dominated geothermal systems. In this study, two methods were employed to measure adsorption and desorption is porous media. The first was with a commerical prototype BET apparatus. A study into the rock particle sizes used in experiments and the rate of pressure change used to determine equilibrium were made. The sorption isotherms measured for geothermal rock demonstrated a strong hysteresis between the adsorption and desorption curves.

The second method studied used a transient pressure model. Samples were filled with steam and the steam allowed to adsorb. One end of the core was then opened and the pressure decline with time was measured. This data was matched using a finite difference program utilizing the Langmuir equation and a regression program, producing the constants for the Langmuir equation. Data has been collected but computet. program errors have prevented the regression step of the procedure.

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Section 1

Introduction

Adsorption is the adhesion of a molecule to the surface of a solid. The adsorbing phase is referred to as the adsorbate while the solid is the adsorbent. Adsorption is classified as either physical or chemical adsorption. Chemical adsorption often involves the chemical alteration of the adsorbing mass. Steam and natural gas adsorption are considered to be physical adsorption. Physical adsorption is characterized by low heats of adsorption, multiple layering of molecules on the surface of the solid and the amount of adsorbate is a strong function of the adsorbent or porous media.

Adsorption is quantified by an adsorption isotherm. This is a measure of the mass adsorbed at a specified temperature and the reduced pressure: the pressure divided by the saturated vapor pressure at the temperature of the data acquisition.

Adsorption occurs on rock surfaces and in micropores, which are pores less than 20 A in diameter. Micropore adsorption is larger than surface adsorption, thus the distribution and abundance of micropores plays a key role in the amount of adsorbate. Formations with large amounts of space available in the micropores are typically low permeability formations.

Normally in petroleum engineering, gas is believed to be stored as a compressed gas in the pore space and as solution gas in liquids. In coal beds and Devonian shales, methane adsorption is believed to be a major factor in the storage and release of gas. In these systems, adsorption is believed to be the dominant reservoir storage mechanism.

Not long after the tax trial for the Geysers steam producers in **1968,** it became evident that steam was stored in the reservoir as a liquid. However, the reservoir pressure is too low for a liquid to exist at the reservoir temperature. Ramey (1990) called this the "Geysers paradox". Adsorption is a mechanism which permits existence of a liquid at pressures below the saturation vapor pressure. In this study, reservoir engineering for geothermal systems under adsorption will be studied.

Section 2

Literature

The most popular method for measuring the equilibrium mass of fluid adsorbed is the BET method named for Brunauer, Emmit and Teller (1938). In this method, a porous material is exposed to a known volume of gas. The pressure is allowed to equilibrate. The amount of gas adsorbed can derived from the difference between the amount of gas injected and the amount of gas at the equilibrium pressure. This type of instrument is available commercially for the measurement of adsorption of gas on a solid.

Measurement of steam adsorption is difficult because the apparatus must be kept at elevated temperatures. Equipment for steam adsorption was described by Hsieh (1980), by Herkelrath and Moench (1982), and Leutkehans (1988). Descriptions of this kind of apparatus can be found in all three references. All three studies reported difficulty in reaching equilibrium. The times for experiments to reach equilibrium were long and leaks in a system often developed.

Herkelrath et al. also performed transient flow experiments. Adsorption caused long time delays in pressure-time response to flow changes. Moench and Atkinson (1978) studied transient radial steam flow in a reservoir with numerical modeling. In this single-well simulator, there was an immobile liquid phase which could vaporize. Their results showed a significant time delay in the pressure draw down response. Moench and Herkelrath (1978) modified this computer program to include adsorbed water. The results produced pressure draw down time delays like those in the work of Moench and Atkinson(1978).

Herkelrath et al. (1983) confirmed the results of the numerical model by building a BET type device and measuring equilibrium adsorption. They also built a transient gas flow apparatus based on the classic Wallick and Aronofsky (1954) experiments. Wallick and Aronofsky demonstrated that transient gas flow would follow non-linear flow of ideal gases in a porous medium.

Herkelrath et al. demonstrated that steam flow was different from the gas flow theory established by Wallick and Aronofsky. Using a numerical model and the adsorption isotherm measured with the BET experiment, they were able to match results of transient flow experiments.

The objective of the present research was measure the equilibrium steam adsorption for vapor-dominated geothermal reservoir rock to determine whether adsorption could be an important steam storage mechanism. A secondary objective was to determine whether a transient flow experiment could be used to extract an equilibrium adsorption isotherm.

Section 3

Statement of Purpose

The adsorption of steam and natural gas in a porous media falls under the category of physical adsorption meaning that adsorption is a strong function of the porous medium. Because most formations are heterogeneous, the adsorption amounts should vary. To get a good assessment of adsorption variation, many measurements of sorption isotherms are needed. Measurements of adsorption are usually made using Brunauer, Emmit and Teller (BET) equilibrium instruments. These instruments can be used to measure adsorption directly but may require many weeks to complete equilibrium measurements and are prone to leaks. The Stanford Geothermal Program has acquired a prototype BET device which can be used measure steam adsorption.

The objective of this project is two fold. The first objective is to measure adsorption of steam for geothermal rocks. The second objective is to study a new method for measuring adsorption isotherms by using a transient flow model.

Section 4

Apparatus and Procedure

The equilibrium sorption measurements were made with a commercial PMI Sorptometer and transient flow experiments were made with the apparatus constructed at the USGS by Herkelrath et al. This section will provide a general description of the equipment and the procedures followed. For readers requiring more detail on the operation or on the equipment, references will be provided.

4.1 Sample Preparation

Core samples were crushed to a desired size in a series of steps. The core was first broken in pieces less than one inch in size by using a hydraulic press. These pieces were put through a jaw crusher which reduced the size to less than 5 millimeters. These pieces were hand ground to the desired size using a mortar and pestle.

To separate the crushed core or the well cuttings to a specific size, the samples were sieved using standard sieves. For the transient model, the sieved samples were packed into the sample holder by pouring in a small amount of the sample and then tapping the holder for 10 to 30 seconds. It is believed that additional packing occurred once the sample was inside the air bath. The air bath was a forced air type and had a significant amount of vibration.

The sample holder for the PMI Sorptometer can accommodate particles less than 7 millimeters. The samples were sieved to remove particles too large to fit in the holder. The sample was sieved further when an exploration of the effect of particle size was targeted. The sieved samples were poured into the holder. Compaction of the sample was not necessary. But, the holder was tapped to consolidate the sample as much as possible to gain the largest sample weight.

4.2 Equilibrium Measurement of Adsorption

Equilibrium measurements of adsorption were made using a Porous Materials, Inc. (PMI) Sorptometer. The PMI Sorptometer is a fully automated BET type apparatus. This equipment was modified by Porous Materials, Inc. for the Stanford Geothermal Program. This equipment is now available from the manufacturer. Greater detail about this apparatus can be found in the operators manual. Inquiries about the equipment should be sent to Porous Materials, Inc., **83** Brown Road, Ithaca, NY 14850, (800) 332-1764 inside the continental U.S. or (607) 257-5544.

The instrument requires weighing, loading and removing samples. Prior to a run, samples were packed as described before, and were weighed using a Mettler PE160 digital analytical balance. The sample was placed in the apparatus and adsorption and desorption were measured. Upon completion of the measurements, the sample was reweighed. This weight was entered into the computer for data processing.

Sorption isotherms were measured at 100 C for all samples. Most of the runs were measured at pressures from 1 psia to pressures close to 14 psia. Desorption data were measured from the maximum pressure to 0.5 psia. A few data sets were measured with a maximum pressure of 10 psia. Measurements made at 140 C were made from 5 psia to pressures close to 40 psia and back to 5 psia. Attempts were made to reach the flat surface saturation vapor pressure, but the instrument was unable to build enough pressure.

Output from the PMI Sorptometer is standard cubic centimeters of gas adsorbed per gram of rock and pressure in psia. This output was converted to grams of gas adsorbed per gram of rock and pressure was converted to relative pressure (pressure divided by saturation pressure) using a main frame computer.

4.3 Transient Measurement of Adsorption

Deriving adsorption isotherms from pressure and time data involves several steps. The pressure and time data is collected using the pressure transient equipment. Permeability of the sample is measured. The pressure and time data are then matched using **a** transient finite-difference program and nonlinear regression. Each step will be discussed below.

4.3.1 Transient Apparatus

The equipment used for this project was built by Herkelrath et al. **(1983)** at the U.S.G.S.. A description of this equipment can be found in Appendix **A.l.** The equipment was loaned to the Stanford Geothermal Program.

Core material was crushed and the sample was packed into the core holder following the procedure described before. The holder was mounted in the air bath. The air bath was allowed to heat for at least eight hours to reach temperature equilibrium. During that time the sample was evacuated.

Once the instrument had reached temperature equilibrium, the core was opened to the steam generator and steam allowed to collect in the pore space and adsorb. Equilibration was reached when the pressures at the top and bottom of the core were equal and static. This required up to **24** hours.

Upon reaching equilibrium, the pressure transducers were calibrated using the vacuum system and a dead weight tester. The temperature of the air bath and pressures at the top and bottom of the sample were recorded. The valve to the bottom of the sample was opened and the pressures at the top and bottom of the sample were recorded versus time using a computer.

Once the core had depleted to atmospheric pressure, the recorded pressures were scaled using the calibration readings. The air bath was turned off and the sample was allowed to cool to room temperature. The sample was removed and permeability was measured according to the procedure described in Section **4.3.2.** The sample was unloaded and weighed. Knowing the volume, weight and approximate density, an approximate value of porosity was determined.

4.3.2 Permeability Measurement

Permeabilities for each transient flow sample are required in using the transient finite-difference program of Nghiem and Ramey (1991), discussed below. Because of the possible settlement of particles as a result of the air bath vibration, permeabilities were measured after the transient run.

The equipment used included a Celesco Model CD-25A Transducer indicator, a Precision Scientific Wet Test Flowmeter, a Celesco Model KP15 transducer and a Hewlett-Packard HP-41CX calculator as a stop watch. The equipment was arranged as shown in Figure 4.1. The transducer and transducer indicator were calibrated prior to the measurements with a dead weight tester.

Measurements for each sample were made at three different pressures. Pressures were selected to span the transducer range. The flow rate was measured by measuring the time for a predetermined volume to pass through the wet test meter. The flow rate was measured three times to reduce errors associated with time measurement.

4.3.3 Finite-Difference Program

A one-dimensional single porosity/permeability finite-difference simulator that includes adsorption was developed by Cuong Phu Nghiem and Henry J. Ramey, Jr. In the program, adsorption and desorption are represented by the Langmuir (1916) equation:

$$X = \frac{p/p_b}{a+bp/p_b} \tag{4.1}$$

Langmuir developed this equation by balancing the rate of evaporation and condensation. Algebraic manipulation produces the form of Eq. **4.1.** Terms a and b are constants.

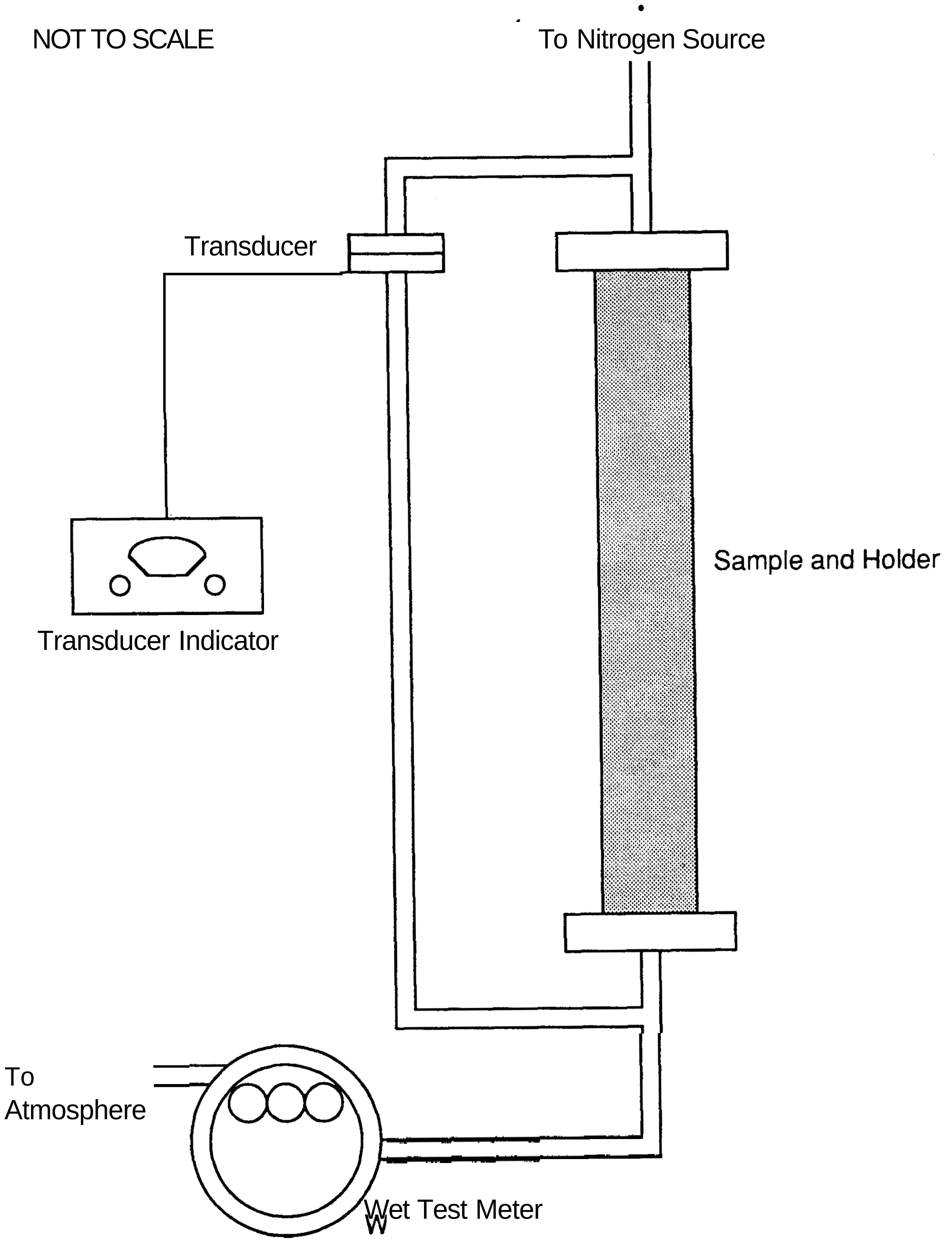

Figure **4.1:** Apparatus for Permeability Measurement

The finite-difference solution is based on the mass balance of Eq. 4.2.

$$A\frac{\partial m}{\partial t} + B\frac{\partial^2 m}{\partial^2 x} + C\frac{\partial m}{\partial x} + qRT = 0 \tag{4.2}$$

where:

$$A = \varnothing M \mu c_g \left(1 - \frac{\rho_r}{\rho_w}\frac{1-\varnothing}{\varnothing}\right) + \left(\frac{zRT}{p_v} - \frac{M}{\rho_w}\right)\rho_r (1-\varnothing)\mu \frac{\partial X}{\partial p_v} \tag{4.3}$$

$$B = - M K \tag{4.4}$$

$$C = \frac{M_2}{RT}\frac{2 K g p_v c_g}{z} \tag{4.5}$$

and:

$$m(p) = 2 \int_{p_m}^{p} \frac{p}{\mu(p)\, z(p)}\, dp \tag{4.6}$$

$m(p)$ is the real gas potential of Al-Hussainy et al. (1966).

This program was developed to compute transient pressures like those in the experiment and supply the model for regression in the determination of the desorption isotherm, which will be discussed next.

4.3.4 Regression Program

The file containing the pressure transient data and time was transferred to the main frame computer (Pangea). **A** nonlinear regression program using the finite-difference model of Nghiem and Ramey was developed by Ming Qi and Roland Horne. The program uses the subroutine DUNLSF of the IMSL library. This subroutine uses the Leverberg-Marquardt algorithm and a finite-difference Jacobian. Using this program, regression may be performed using the pressure transient data to produce a desorption isotherm following the Langmuir equation.

Section 5

Results and Analysis

The main purpose of this research was to explore the possibility of faster methods for adsorption and desorption measurements and to make measurements of steam for geothermal rock. As stated in the previous section, two methods were employed. The results of each will be discussed separately.

5.1 Equilibrium Measurements

The PMI Sorptometer is a fully automated BET type device. The equilibrium pressures and volumes of steam adsorbed are recorded in a data file. The Sorptometer processes the data by using the ideal gas law to convert the mass of steam adsorbed to standard cubic centimeters of water vapor at atmospheric pressure and 0 C per gram of rock.

Standard cubic centimeters of water vapor were converted to grams. Ideal behavior was assumed to correct density at 0 C and vapor pressure at 0 C to one atmosphere. Reduced pressures were computed by dividing the pressure by the vapor pressure at the run temperature.

In processing the data, density for the rock grains is required by the PMI Sorptometer. The data output program uses rock grain density to determine the volume occupied by the rock. During the course of this research, rock densities were not measured. Conventional handbook values were assumed. Sample grain densities will be measured in the future.

5.1.1 Pressure Equilibrium Determination

Previous BET studies at Stanford used solid cores and allowed the pressure to reach equilibrium. The time for the pressure to stabilize was as long as days. The PMI Sorptometer software determines equilibrium by the rate of pressure change. The program determines when the pressure changes less than normal pressure transducer drift, say 0.02 psi, over a specified length of time, say 30 seconds. The specified time is referred to in the PMI Sorptometer manual as the "final pressure equilibrium time".

A series of runs were made to determine what effect changing this equilibrium time would have on the amounts adsorbed. The manufacturer recommended a final pressure equilibrium time of 30 seconds. There was some initial doubt whether that was enough time to detect the slow pressure drop as steam adsorbs in the low permeability samples.

A piece of graywacke core material from an unknown well in the Geysers shallow reservoir in the southwestern part of the field was ground into pieces small enough to fit into the sample holder. Adsorption and desorption measurements were made between 1 and 10 psia using final pressure equilibrium times of 30,300 and 1000 seconds. A rock density of 2.65 gram/cc was used for all measurements made on this sample. It was later realized that a density of 2.70 was a better selection. Figure 5.1 shows the adsorption curves for these runs. The curves are nearly identical.

Figure 5.2 shows the desorption curves for these same runs. The curves do not match as well as the adsorption curves. In these three cases, the desorption paths were determined by the maximum amount that was adsorbed which is different for each set. Both Figures 5.1 and 5.2 indicate no important difference caused by final pressure equilibrium times from 30 to 1000 seconds. A comparison of Figures 5.1 and 5.2 shows a significant hysteresis on desorption. This is a common result for the runs made to date.

Increasing the final pressure equilibrium time increased the run time significantly. Using 30 seconds and 300 seconds, the run time was less than one

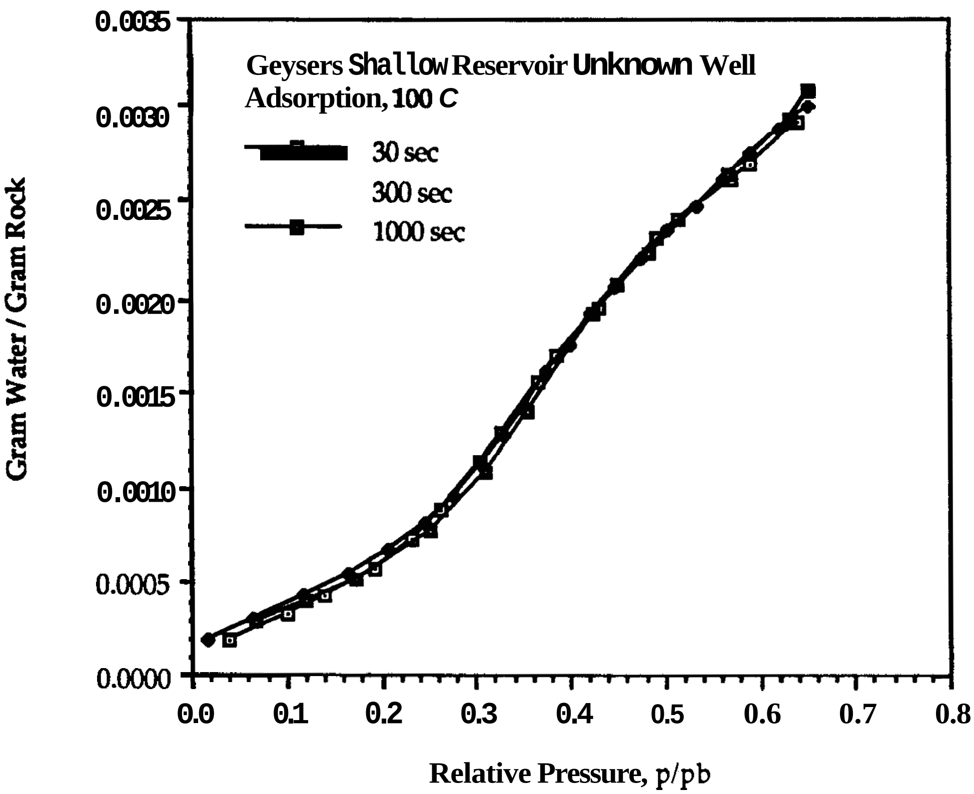

Figure 5.1: Comparison of adsorption isotherms using different final pressure equilibrium times.

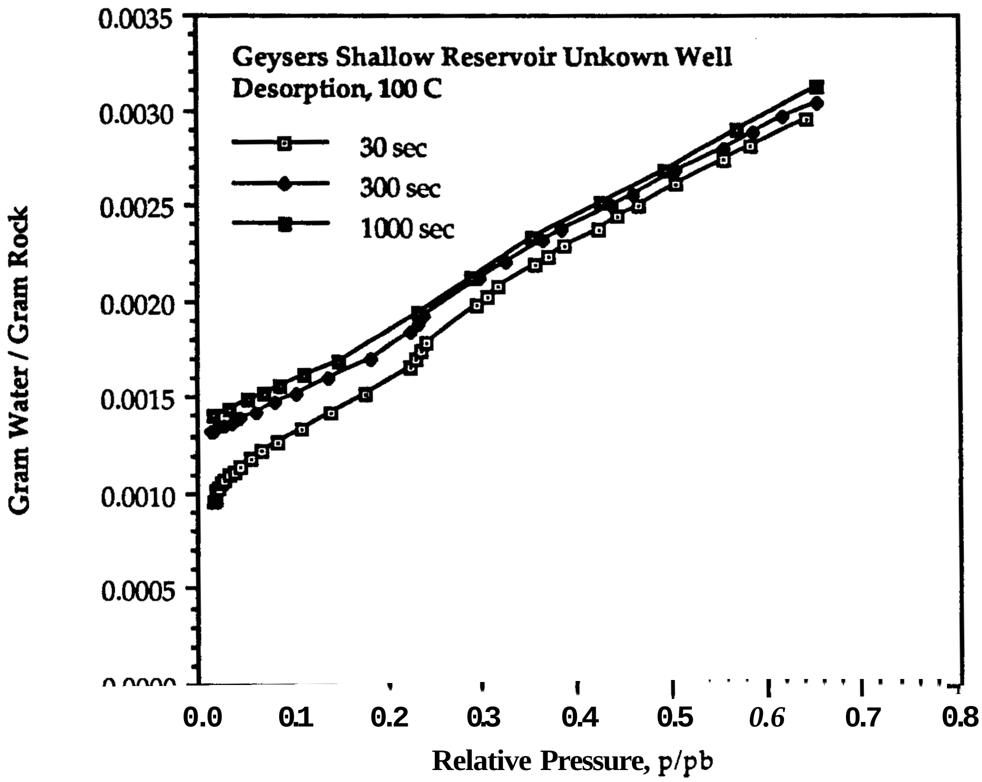

Figure 5.2: Comparison of desorption isotherms using different final pressure equilibrium times

day. In fact, the run time for 30 seconds was only a few hours. However, using 1000 seconds the run time was six days.

5.1.2 Particle Size Effects

Solid core material is often difficult to obtain. In additional, the diffusion rate of steam inside low permeability rock can be very slow. Using crushed rock material or well cuttings should speed the process of adsorption. Well cuttings are often available. However, crushing rock may create surface area. Adsorption is a function of surface area and may be altered by this addition of surface area. Thus adsorption and desorption isotherms for the largest and smallest particles sizes were measured.

A sample from the Geysers shallow reservoir was ground and sieved into samples of different particle sizes. Measurements were made on the sample of sizes greater than 2.362 millimeters. The sample of particles less than 0.583 millimeters was sieved further and adsorption and desorption measurements were made on those particles less than 0.104 millimeters. Figure 5.3 presents the adsorption results and Fig 5.4 presents the desorption results.

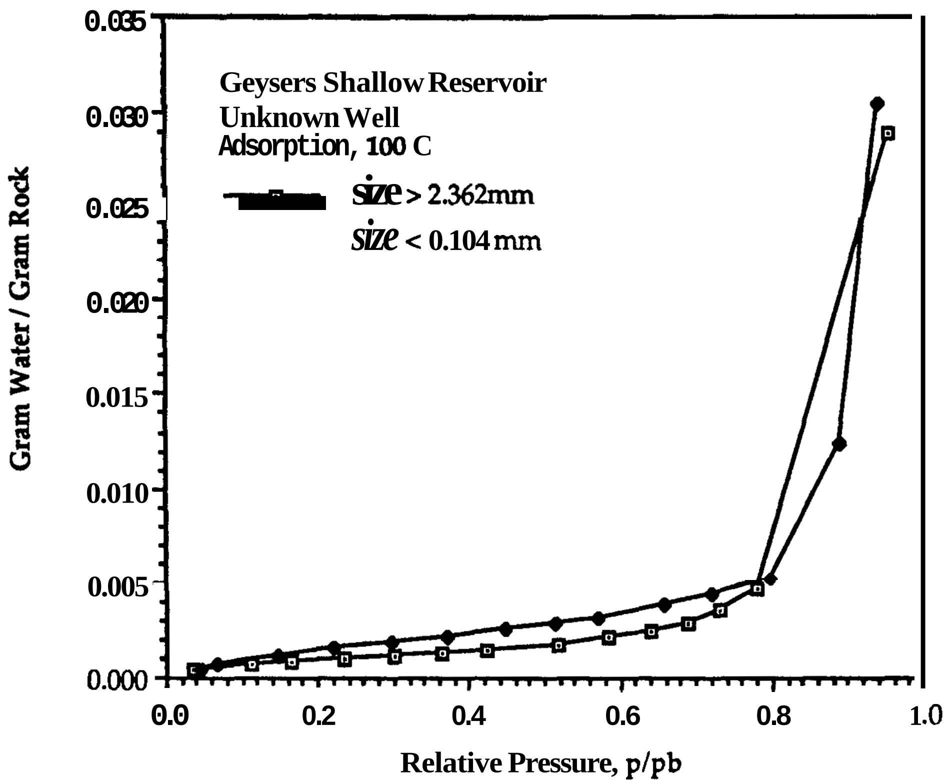

Figure 5.3: Comparison of adsorption isotherms for different particle sizes.

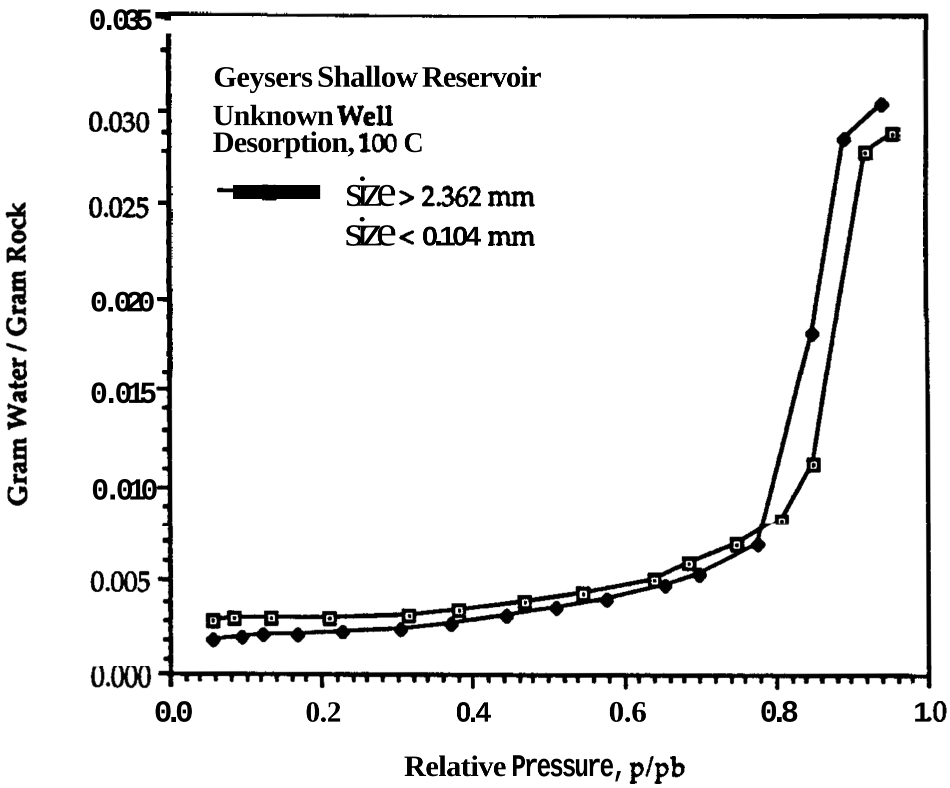

Figure 5.4: Comparison of desorption isotherms for different particle size.

In both figures, the results are similar. The sample of smaller particle size appears to adsorb more than the larger particle size over the entire range of pressure. At the maximum amount adsorbed, the difference is five percent. For the desorption curves, the smaller particle size has a higher maximum adsorbed. But as pressure decreases to a relative pressure lower than 0.8, the smaller particle size retains less than the larger size.

It doubtful that particle size effects are significant for the size range used. Herkelrath and O'Neil (1985) also concluded that disaggregation had little effect on adsorption studies.

5.2 Adsorption Studies for Geothermal Rocks

Adsorption and desorption isotherms for samples from different geothermal areas were measured using the PMI Sorptometer. The first sample was from the an unknown well in the Geysers Shallow reservoir. This is the same sample described before. Figure 5.5 is the adsorption and desorption isotherms at 100 C for the particle size greater than **2.362** millimeters. Figure **5.6** is the isotherms for sizes 1.000 ***to*** **2.362** millimeters at 100 C. Figure 5.7 is the isotherms for particles less than 0.104 millimeters at 100 C. Figure **5.8 is** for the particle size less than 0.104 millimeters at 140C.

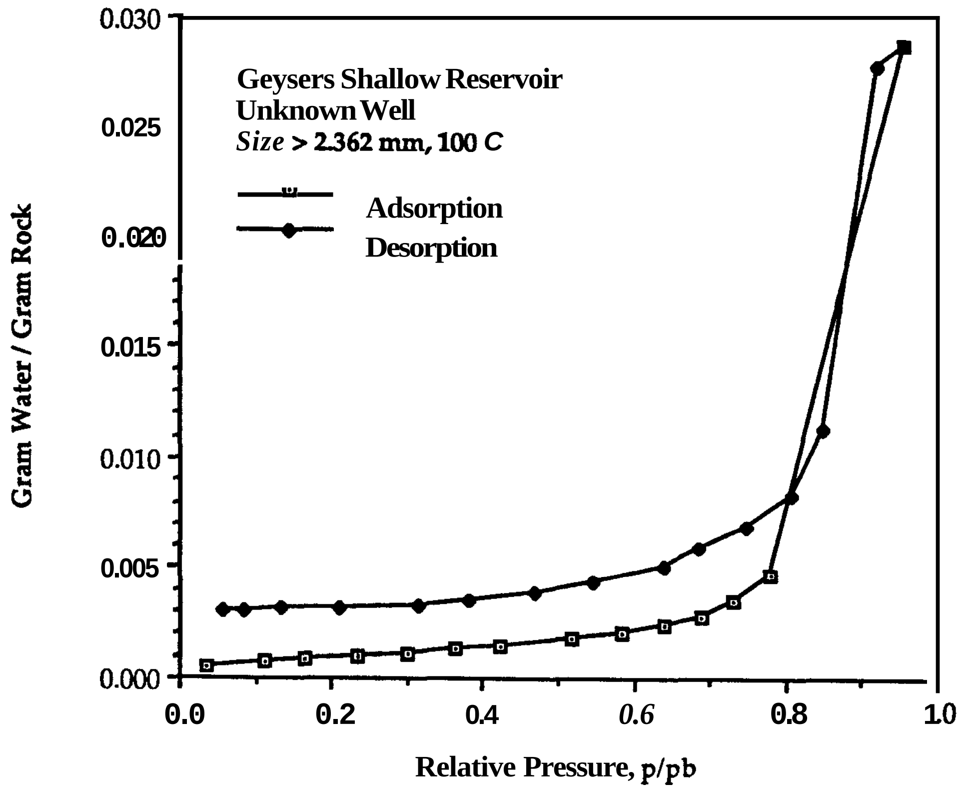

Figure **5.5:** Sorption isotherms at 100 C for an unknown well in the Geysers Shallow Reservoir; particle sizes greater than **2.361** mm.

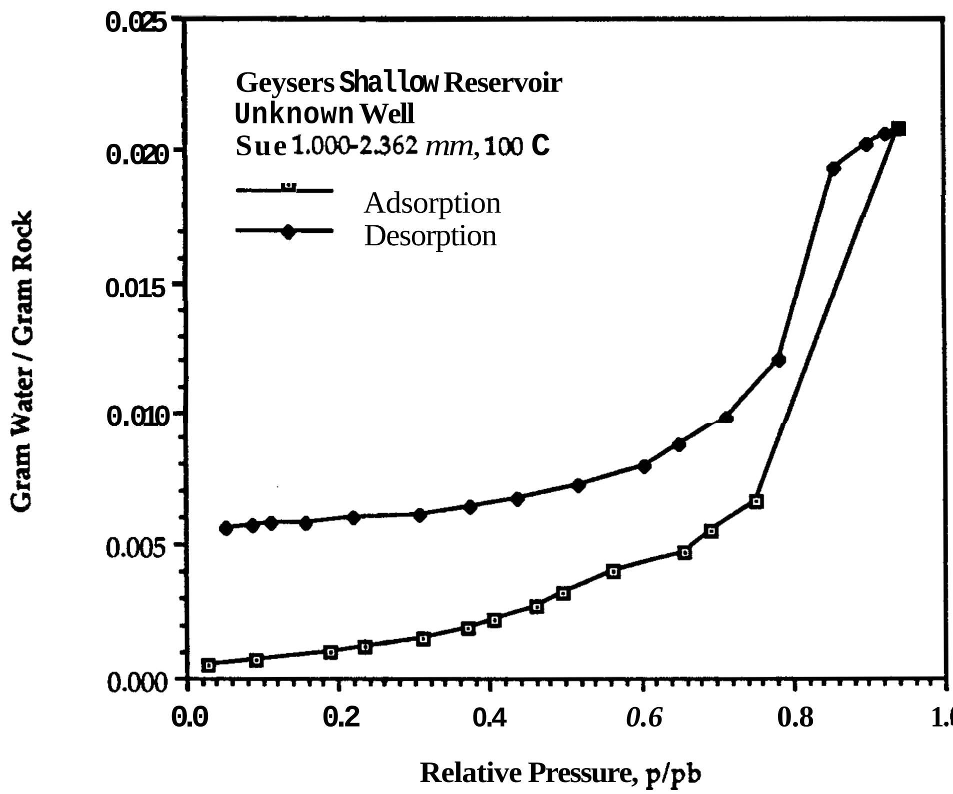

Figure **5.6:** Sorption isotherms at 100 C for an unknown well in the Geysers Shallow Reservoir: particle size between 1.0 and **2.362 mm.**

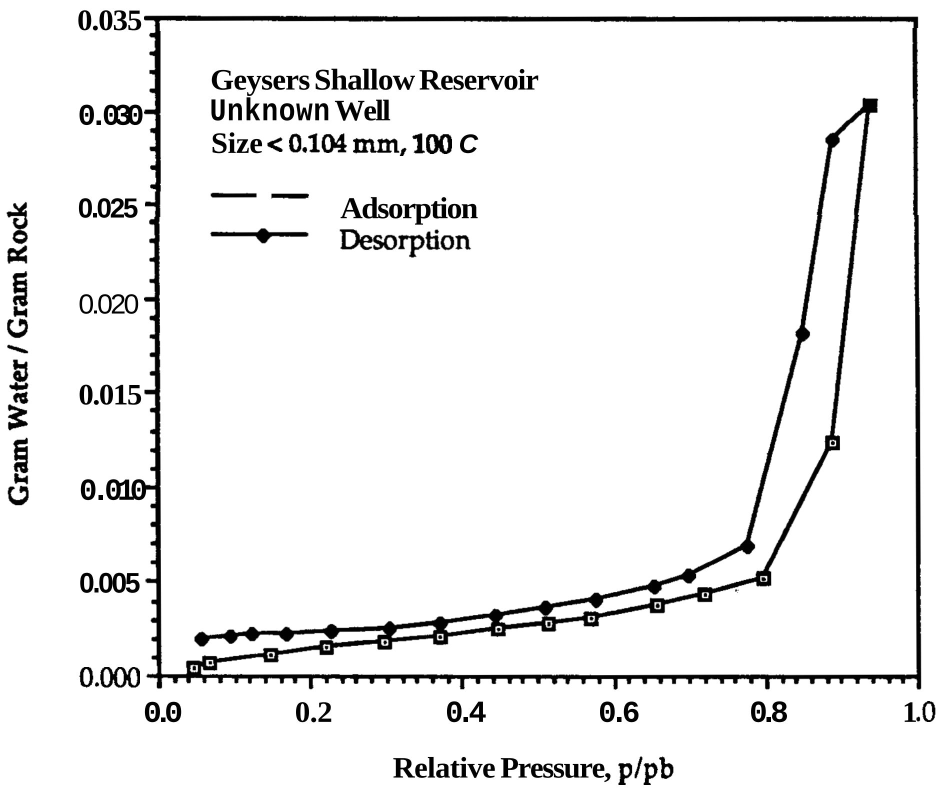

Figure **5.7** Sorption isotherms at 100 C for an unknown well in the Geysers Shallow Reservoir: particle sizes smaller than 0.104 mm.

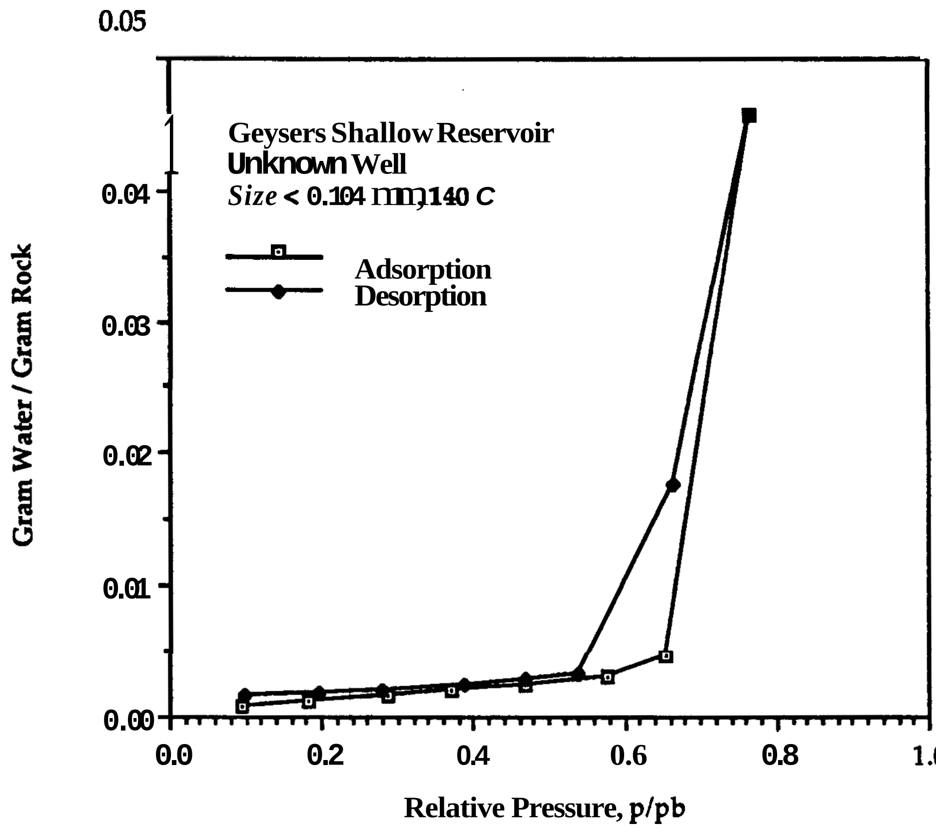

Figure **5.8:** Sorption isotherms at 100 C for an unknown well in the Geysers Shallow Reservoir: particle *sizes* smaller than 0.104 mm.

Well cuttings from the Geysers Field well OF52-11 from a depth of between 5000 to 5200 feet were cleaned and sieved. A sample of particles greater than a No. 270, 0.0533 millimeters, sieve was used. Adsorption and desorption isotherms measured at 100 C are shown in Figure 5.9 and results at 140 C are shown in 5.10. A rock density of 2.70 grams per cubic centimeter was used.

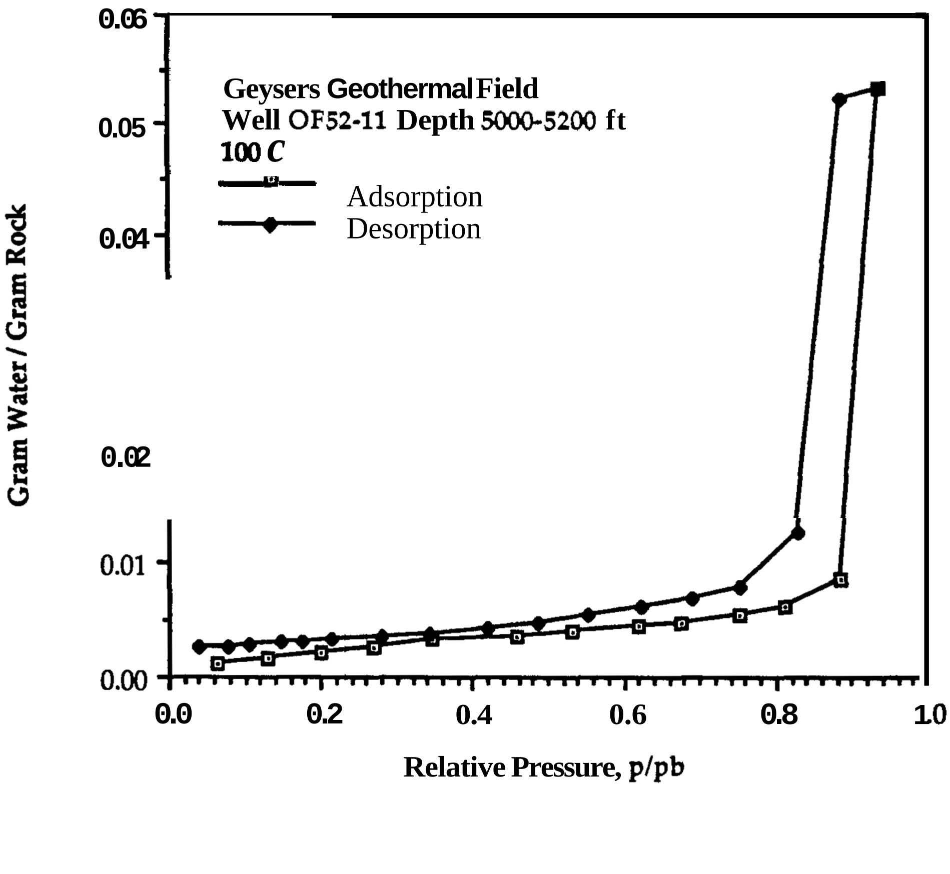

Figure 5.9: Sorption isotherms at 100 C for the Geysers Well OF52-11 5000-5200 ft.

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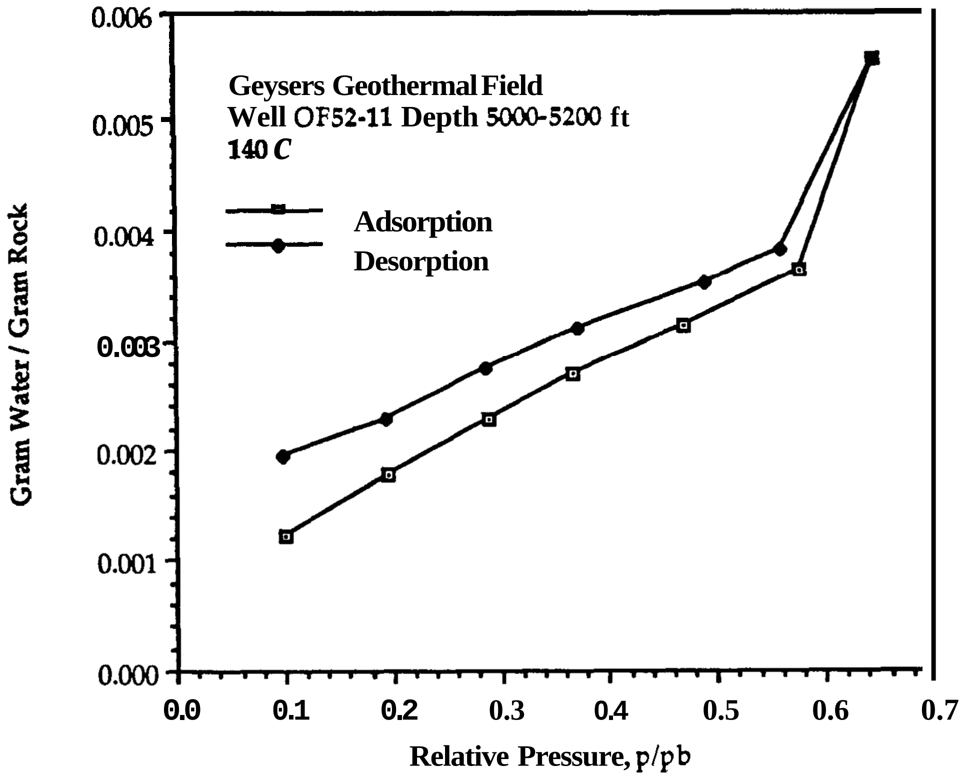

Figure 5.10: Sortion isotherms at 140 C for the Geysers Well OF52-11 5000-5200 ft.

The last was a sample from the Reyjkanes No. 9 well in Iceland. This sample was originally well cuttings so no pulverization was performed. A rock density of 2.65 gm/cc was used. The adsorption and desorption isotherms are presented in Figure 5.11. The isotherm was measured at 100 C. Pressures were increased from 1 to 10 psi and decreased in increments of 1 psi.

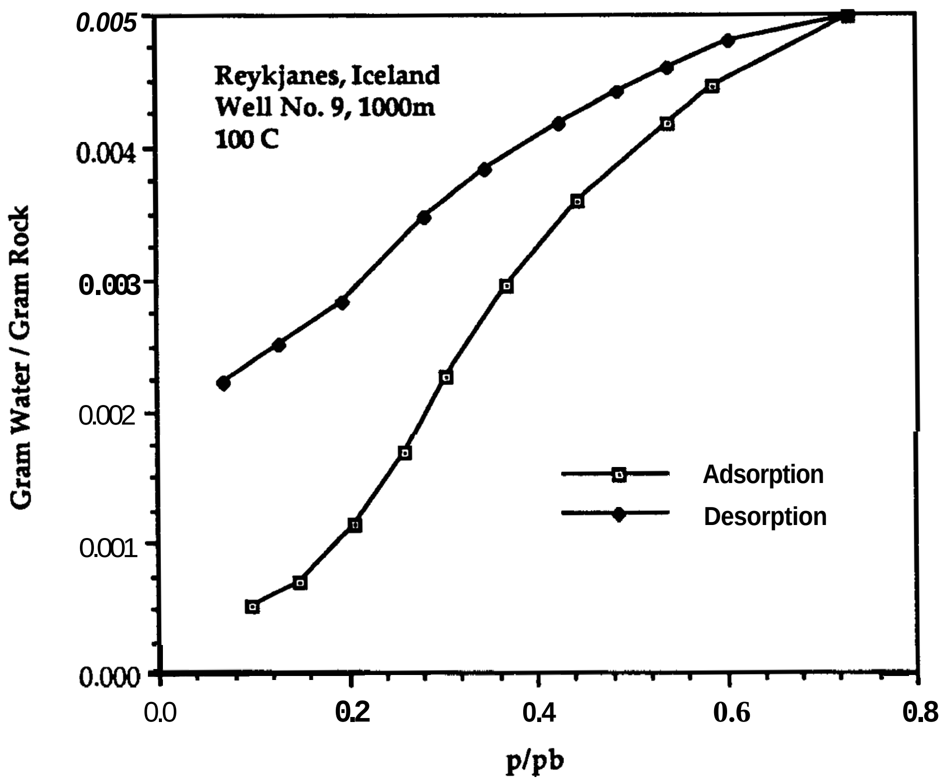

Figure **5.11:** Sorption isotherms for the Reyjkanes No. **9** well, Iceland.

For rock samples from the Geysers, The maximum amount adsorbed ranged from 0.021 to 0.053 grams of water per gram of rock at 100 C. At relative pressures close to 0.8 the amount adsorbed ranged from 0.0046 to 0.0066 grams of water per gram of rock. Herkelrath measured an adsorption amount of 0.011 gram of water per gram of rock at a relative pressure of 0.8 and a maximum of 0.012 grams of water per gram of rock. At a relative pressure of 0.8, the values from this study are approximately one half of those measured by Herkelrath, but the maximum amounts were more than twice of those of Herkelrath.

Herkelrath (1983) et al. found that adsorption data were independent of temperature when graphed versus relative pressure . Sorption isotherms were measured for three of the samples at 100 and at 140 C. Figure 5.12 is a graph of the sorption isotherms for the sample from the unknown well at 100 C and 140 C. Figure 5.13 is a plot of the sorption isotherms for the Geysers OF52-11 well at 100 C and 140 C. The adsorbed amounts versus relative pressure at different temperatures on the same sample do not compare well.

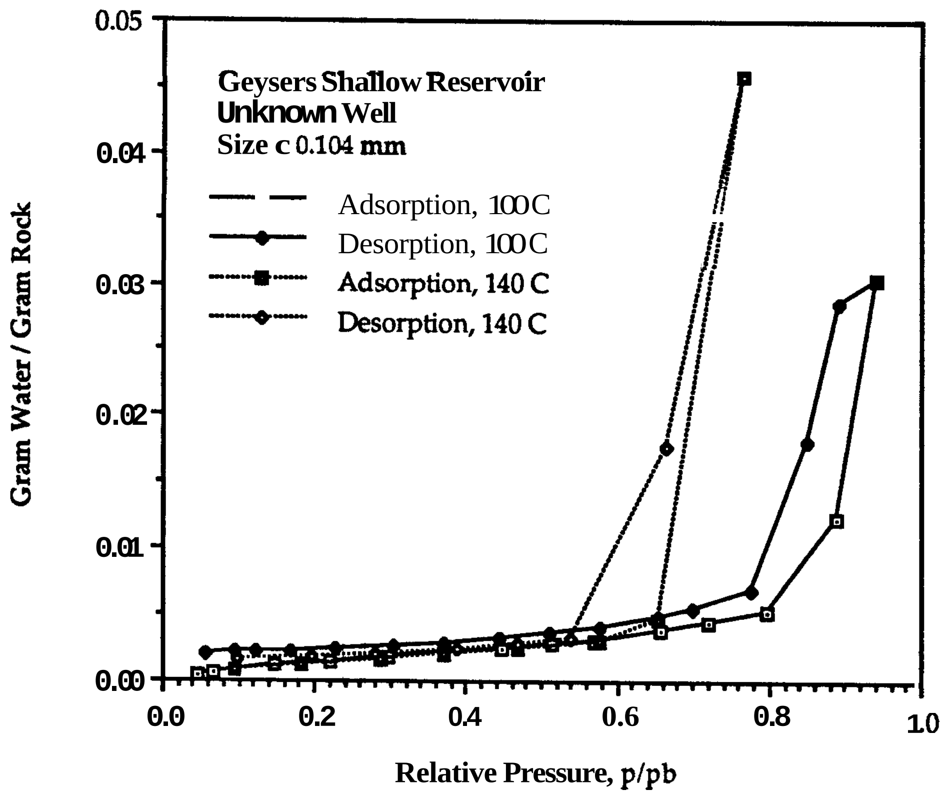

Figure 5.12: Comparison of Sorption isotherms for an unknown well in the Geysers Shallow Reservoir at 100 and 140 C.

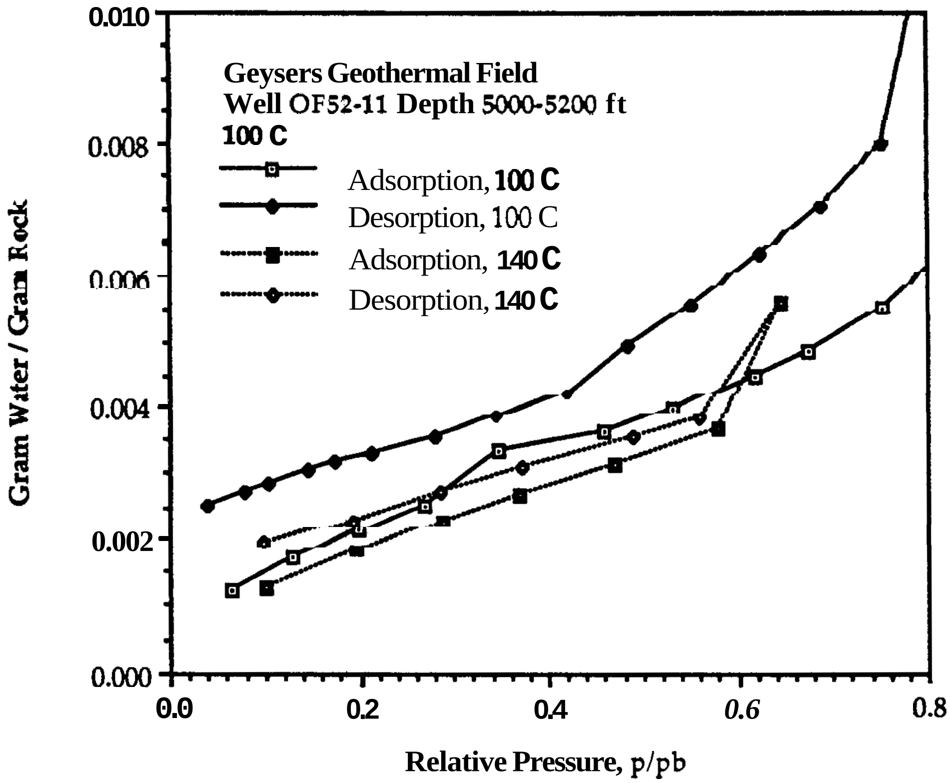

Figure 5.13: Comparison of Sorption isotherms for the Geysers Well OF52-11 5000-5200 ft at 100 and 140 C.

All of the curves can be divided into two areas of different slopes. The transition from the flat portion to a much steeper portion on the isotherm represents the transition from monolayer adsorption to a mixture of adsorption and capillary forces. As the pressure increases towards the saturated vapor pressure, capillary forces begin to dominate. The Langmuir isotherm, used in the finite difference program, appears to be valid in the region of monolayer adsorption.

For all samples, a hysteresis between the adsorption and desorption isotherms is evident. Hysteresis is also evident in the-transition from pure adsorption to capillary pressure control. At 100 C, the adsorption curves rise at relative pressures of 0.8 to 0.9, while the desorption curves drop between relative pressures of 0.75 to 0.8. The results for 140 C appear to transition at much lower relative pressures. The two adsorption curves rise at relative pressures of *0.66* to 0.57, while the two desorption curves drop at relative pressures of 0.57 to 0.55.

Melrose (1991) experienced hysteresis between adsorption and desorption of nitrogen in porous material. He suggested that hysteresis could be attributed to the stability limit of a liquid phase. He also suggested alteration of the clay surface could have occurred. Bell and Rakop (1986) suggested that the activation energy in adsorption was the heat of adsorption, but in desorption the activation energy was equal to the heat of adsorption and the activation energy associated with the interaction between the adsorbent and adsorbate. It is odd that the hysteresis experienced in this study is so much greater than that reported by others.

5.3 Transient Experiment

The core holder designed by Herkelrath et al. (1983) is 2 inches in diameter by 30 inches long. Field core material in the volumes need to fill this core holder are unavailable. This made it necessary to build a smaller core holder.

Solid cores, even a one cubic inch plug, core could take days to desorb. Crushing the core into small aggregates or using well cuttings was an option to reduce the time of desorption. The small pieces would reduce the time of diffusion of steam through the rock matrix but the overall permeability would be increased greatly.

In a sample of crushed core the steam should flow in two regions. The first is in the low permeability particles. Once the steam has reached the surface of the particle, steam will flow through the interparticle space. Crushing the rock material creates new surface area. At some point, the added surface area could affect the adsorption measurements.

The design of a new core holder involved building a small core holder to produce a large enough time delay to produce a unique desorption isotherm. Particle size has a strong influence on the effective permeability. The Kozeny equation, Equation 5.1 relates the permeability of a sample with the particle size that is cubic closest packed.

$$k = \frac{1}{72\,\tau}\,\frac{\varnothing^3 D_p^2}{1-\varnothing^2} \tag{5.1}$$

The equation is reasonable for an order of magnitude estimate. A pack of particle size of 2 mm should have a permeability of between 2,000 and 10,000 darcys. To reduce the permeability, several different particle sizes can be used. Muskat (1937) lists sand stones in a tabular form. In this table, the weight percent distribution of particle sizes and the permeability were given. A number of samples with particle sizes between 2.0 and 0.053 millimeters had permeabilities between 1.1 and 3.4 darcys. This table was used as a general guideline for the size particles required to produce a lower permeability.

Using the simulator developed by Nghiem and Ramey (1991), a number of runs were made for various sample lengths and the penneabilities. Based on the Kozeny equation and data taken from Muskat's book, the permeability was varied between 2 and 10000 darcys. The current configuration requires that the sample holder be less than 62 centimeters in length. Lengths used were 10, 20, 30 and 60 centimeters. The other parameters used are reported in Table 5.1. The Langmuir parameters were for a sample of Geysers graywacke. Graphs of computed pressure at the closed end of the core versus time can be found in Figures 5.14 through 5.17.

The results indicate that even the shortest core holder should be sufficient. Additional computer runs were made for the sand pack used by Herkelrath et al. (1983). As can be seen in Figure 5.18 depletion of the sand pack was rapid. The parameters used in these runs are listed in Table 5.2. The desorption isotherm used in simulating the experiments at the USGS was that given by Herkelrath et al. (1983).

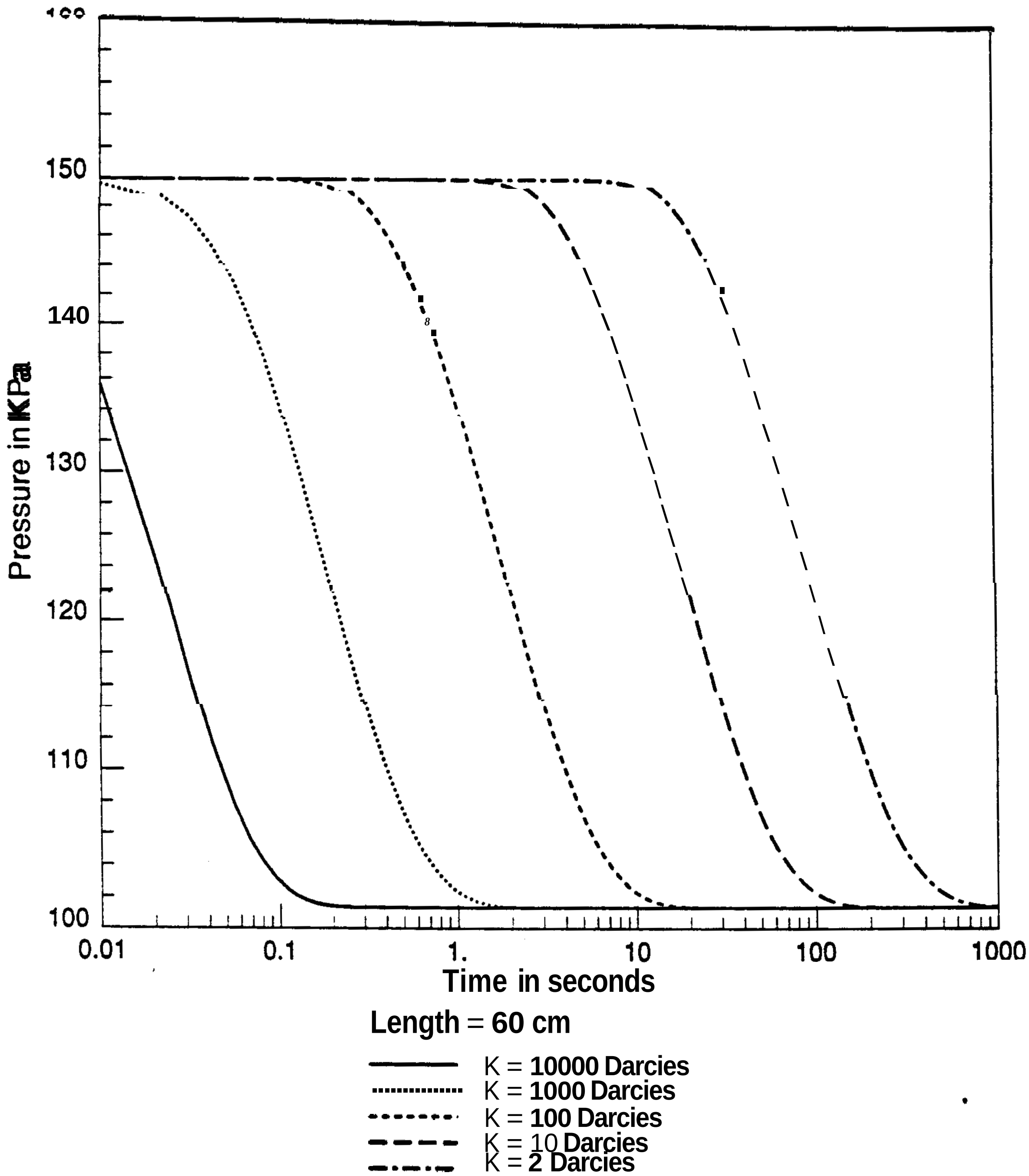

Figure 5.14: Pressure vs. Time for a Sample Length of 60 cm

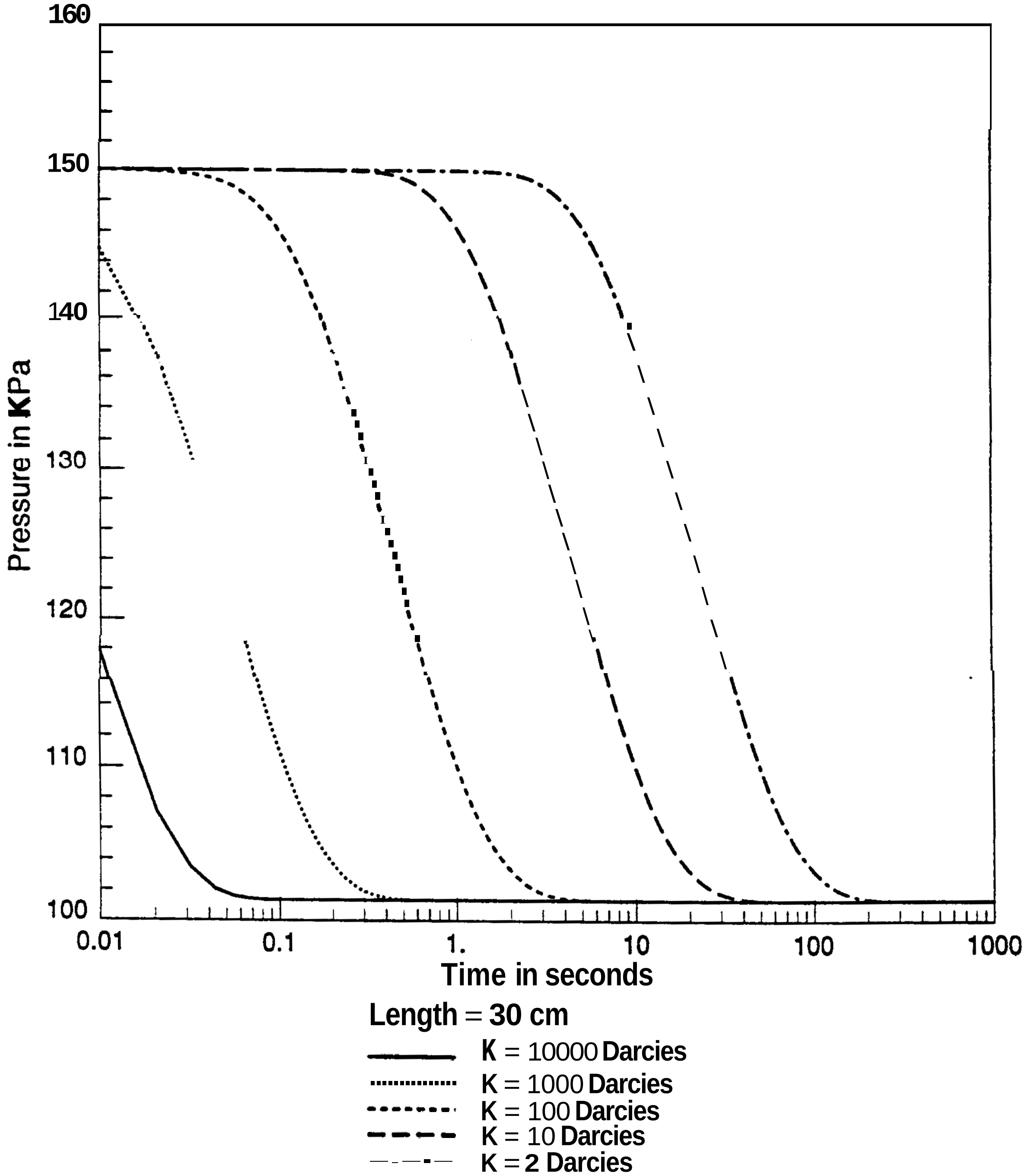

Figure 5.15: Pressure vs. Time for a Sample Length of 30 cm

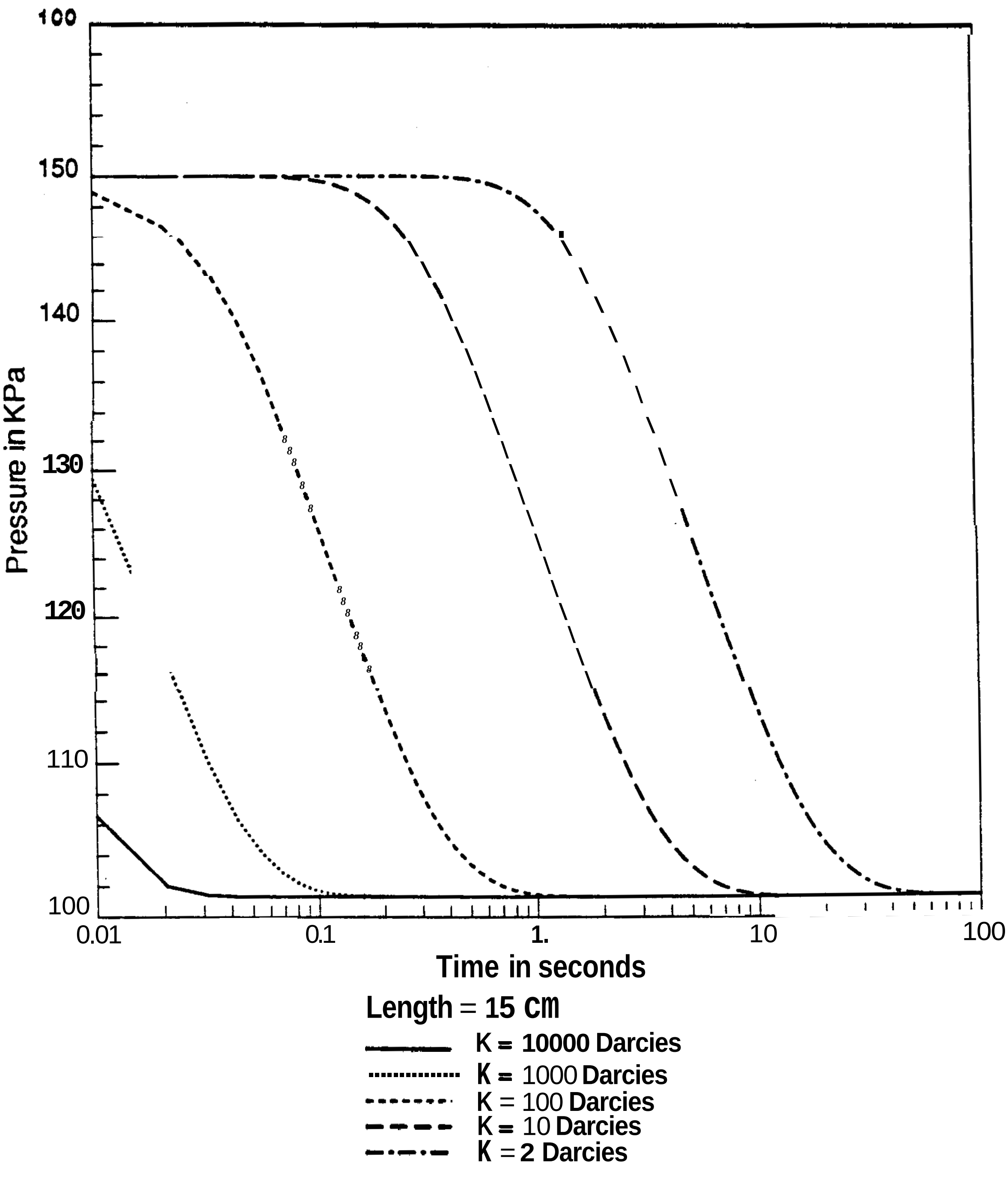

Figure 5.16: Pressure vs. Time for a Sample Length of 15 cm

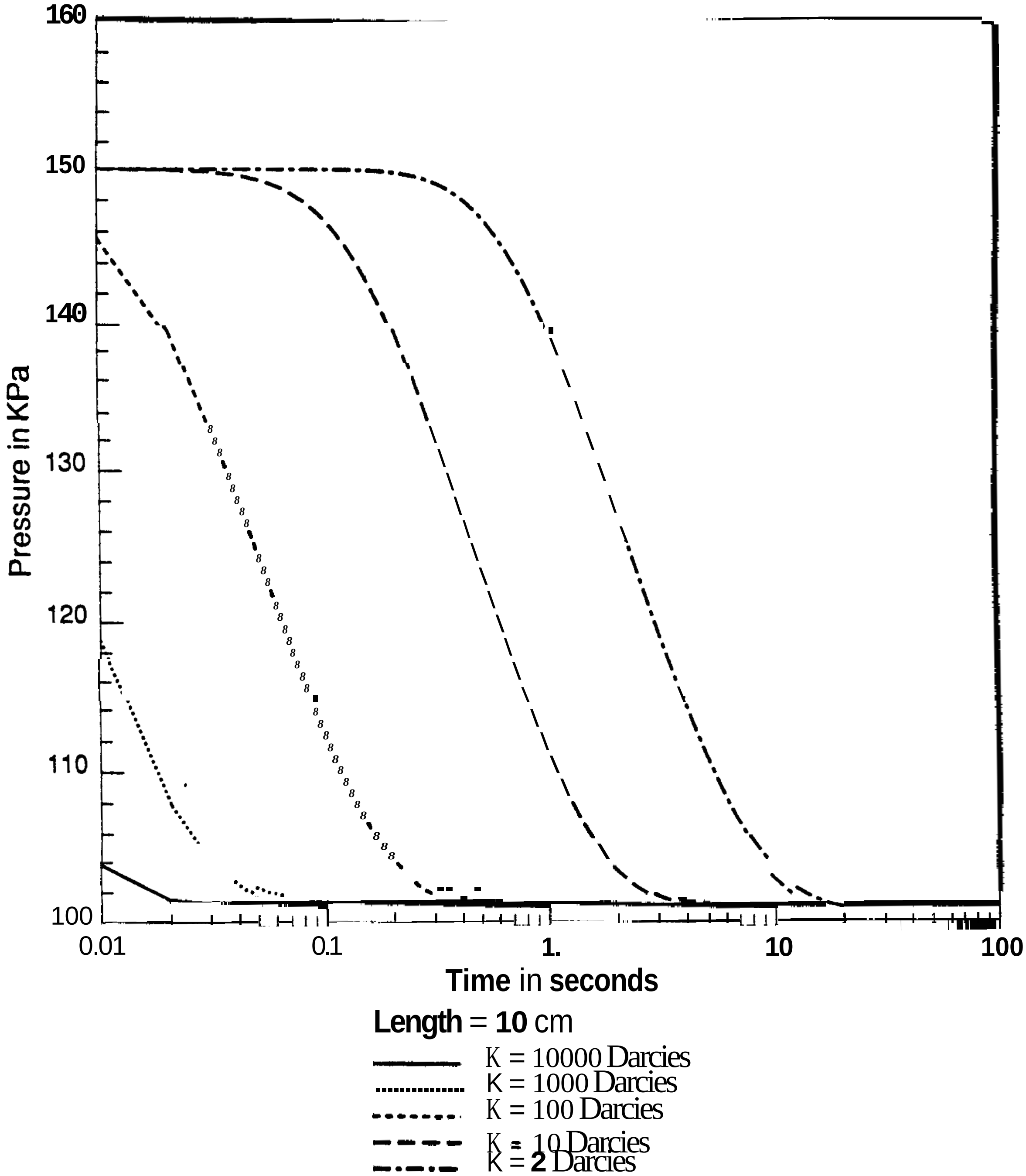

Figure 5.17: Pressure vs. Time for a Sample Length of 10 cm

Table 5.1: Parameters used in the finite difference simulator to investigate the best sample holder size.

Saturated Vapor Pressure, p_b	2,226,950.	dyne/cm^2
Initial Pressure	1,500,000.	dyne/cm^2
Outlet pressure	1,013,250.	dyne/cm^2
Porosity, O	0.42	fraction
Langmuir parameter, a	31.	
Langmuir parameter, b	53.	
Fluid	Steam	

Table 5.2: Parameters of USGS sand pack used in the finite difference simulator to investigate the best sample holder size

Saturated Vapor Pressure, p_b	1,985,400.	dyne/cm^2
Initial Pressure	1,800,000.	dyne/cm^2
Outlet pressure	1,013,250.	dyne/cm^2
Porosity, O	0.42	fraction
Permeability, k	3.65	Darcys
Isotherm parameter, a	0.00864	
Isotherm parameter, b	0.02296	
Fluid	Steam	

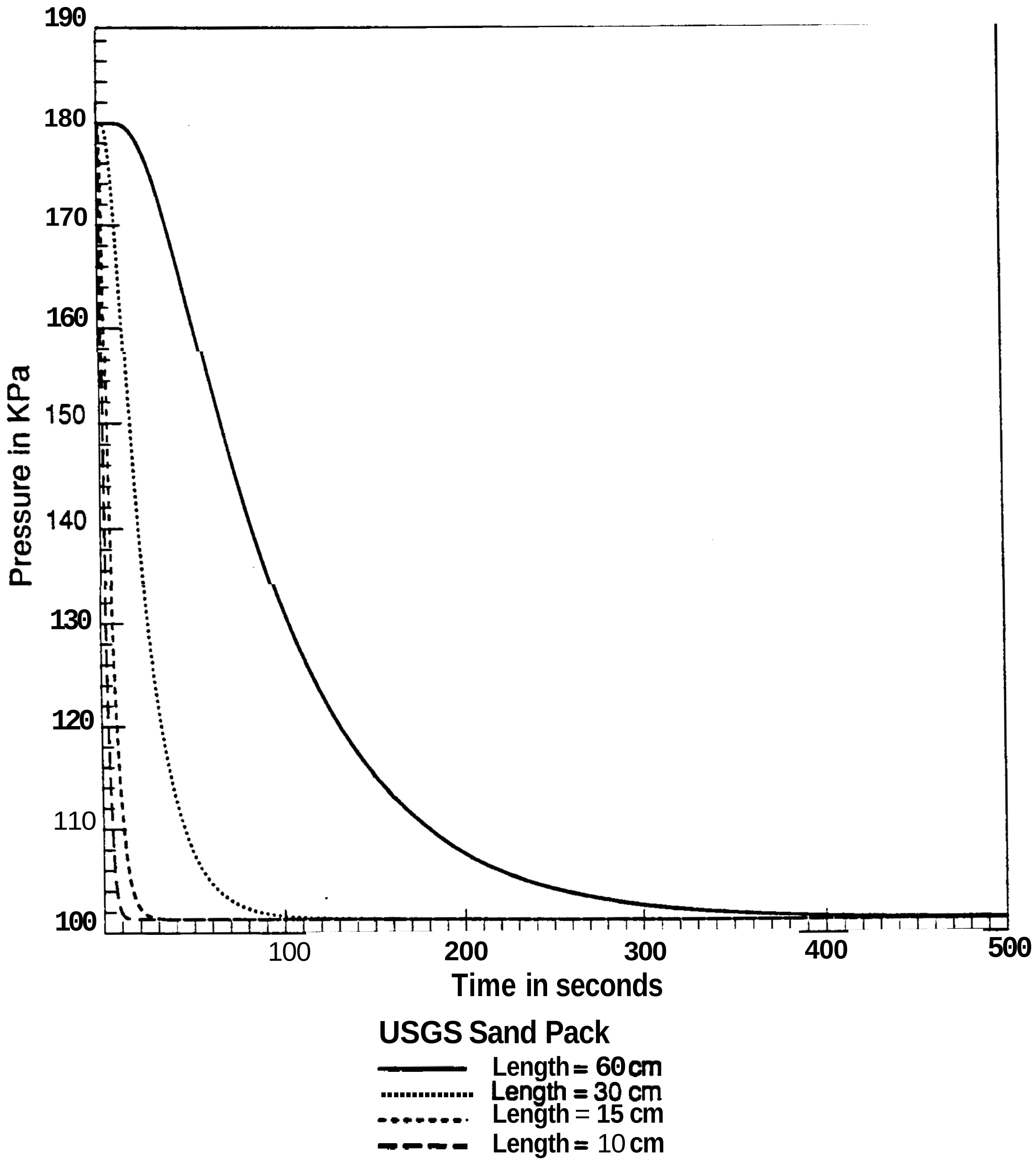

Figure **5.18:** Pressure vs. Time for **USGS Sand** Pack Parameters

Based on results of numerical simulation, a sample length of 30 centimeters was selected. The cross-sectional area of the sample should have no effect on desorption time. However two core holders of different diameters were built with stainless steel flanges silver soldered to the ends of 0.035-inch wall thickness stainless steel tubing. The two core holders were 2.362 centimeters in diameter and 31.27 centimeters in length for the one inch diameter holder, and 1.727 centimeters in diameter and 30.63 centimeters in length for the three-quarter-inch diameter holder.

To date, four runs have been completed on **3** different samples. One run was made on a sample from the Reyjkanes field in Iceland. Two runs were made on a sample from an unknown well in the shallow reservoir at the Geysers, and one run was made on a sample from the Geysers Well OF52-11, depth 5000-5200 feet. The samples were selected to compare the effects of particle sizes on the results of the transient runs and to compare desorption isotherms derived from the runs results to ones measured with the **PMI** Sorptometer.

The Reyjkanes sample was well cuttings from the No. 9 well. The same sample used in the equilibrium instrument. **A** desorption isotherm was measured previously. The sample was sieved and the particle sizes used were those that passed through a No. 10 sieve (2.000 millimeters) and caught by a No. 100 mesh sieve (0.104 millimeters). The cuttings were packed into the three quarters of an inch diameter core holder.

During calibration, the pressure transducer at the bottom of the sample went off scale and a quick adjustment was made to return it to scale. In doing so, the atmospheric and vacuum readings were not in the desirable range of approximately 0.5 volts for atmospheric and less than 0.01 volts for the vacuum. The transducer at the top of the sample was the one of interest. However the program which converts the data to **ASCI** form takes into consideration the calibration readings on both the top and bottom transducer when scaling the raw voltages. Figure 5.19 is a graph of the pressure at the top of the sample versus time.

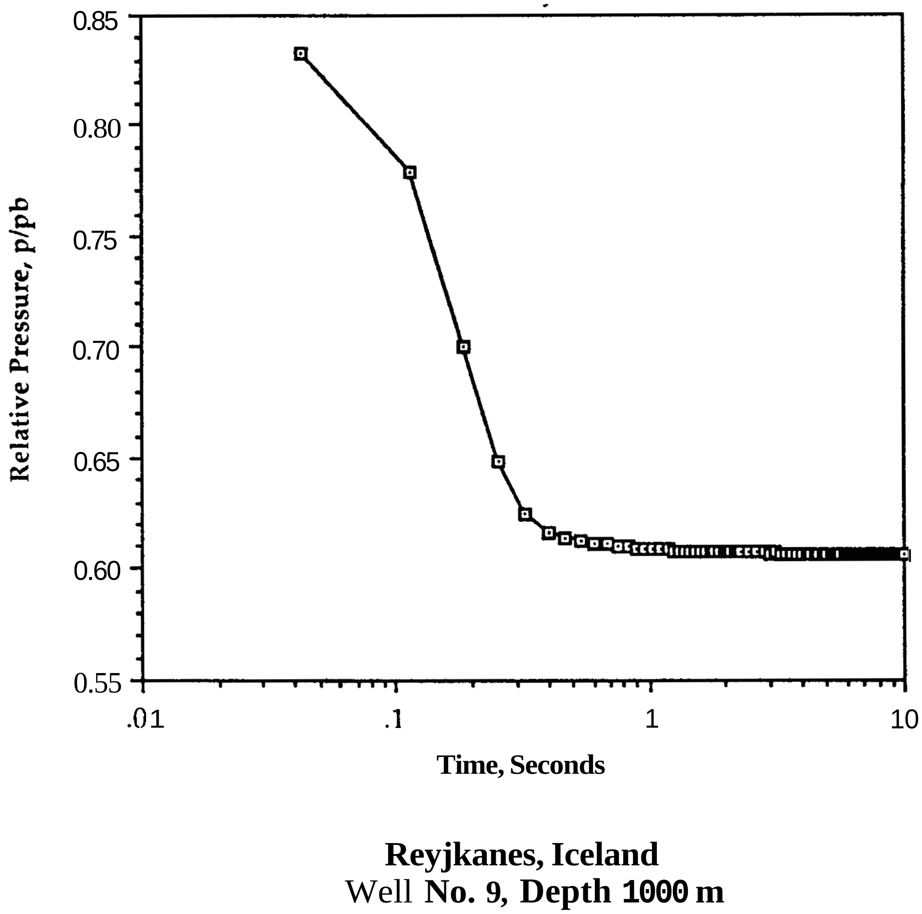

Figure 5.19: Pressure at the Closed End of the sample for the Reyjkanes No. 9, 1000 meters

Sample permeability was measured in the horizontal position. The Klinkenberg effect was corrected and the permeability to liquid was determined to be 8 darcys. The sample was removed and weighed. The final weight was 110.095 grams.

Transient runs 2 and **3** were performed on the sample from the unknown well in the Geysers shallow reservoir. The first sample was crushed core which passed through the No. 10 mesh sieve and was retained by a No. 150 mesh sieve. The sample was packed into the one-inch core holder. Steam was allowed to adsorb overnight. The pressure transducers were calibrated at 15 psig. The atmospheric pressure was assumed to be 14.7 psia. The pressure decline for this sample is presented in Figure 5.20.

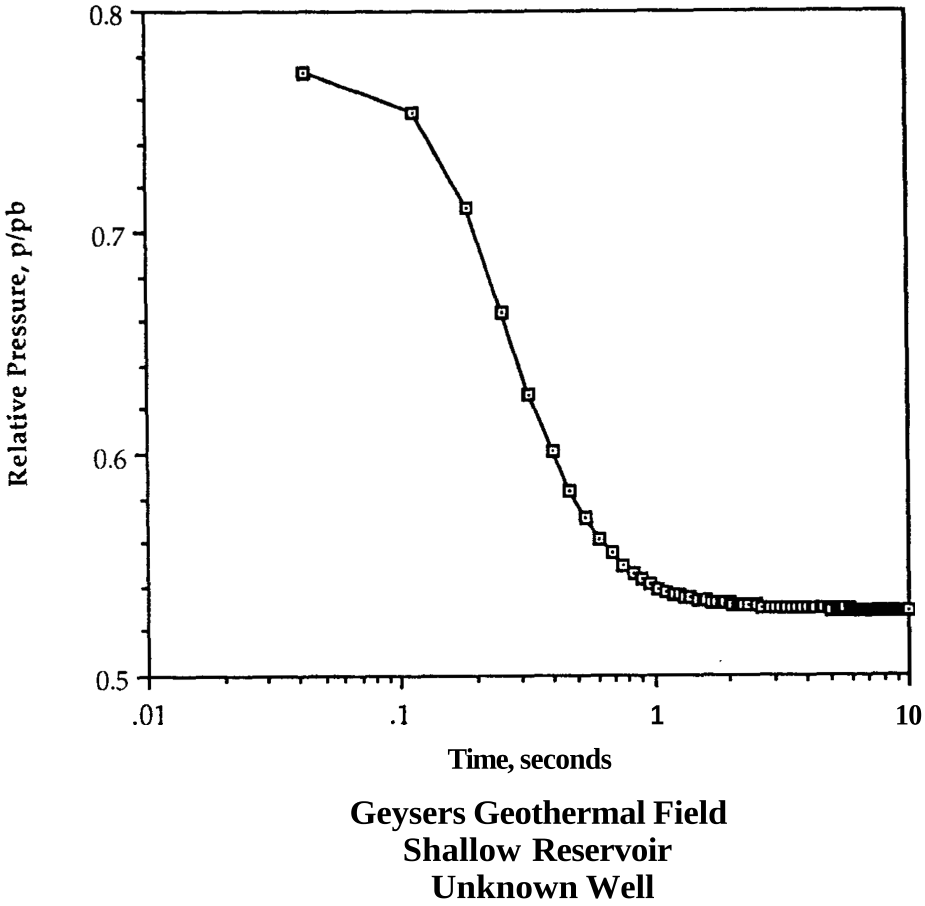

Figure 5.20: Pressure at the Closed End of the sample for the Geysers Shallow Reservoir, Unknown Well, Particles Between 2.0 and 0.104 mm

Permeability was measured after the run with the core holder in a horizontal position. Permeabilities were determined at pressure differences of 14.5, 12.1 and 6.58 psi. The Klinkenberg effect was removed and the permeability to liquid determined to be 27 darcys. The procedure was taken from Amyx, Bass and Whiting (1960). Because the sample weight exceeded the maximum weight of the scale, the sample was weighed in two increments. The weight was 217.121 grams.

The sample was ground again with a mortar and pestle to decrease the size of the particles. The sample used for run **3** was that which passed through a No. 30 sieve and was retained by a No. 150 sieve. The sample was packed into the three-quarter-inch holder. Steam was allowed to adsorb for 22 hours. The pressure transducers were calibrated at 15 psig. The atmospheric pressure was assumed to be 14.7 psia. The pressure decline is presented in Figure 5.21.

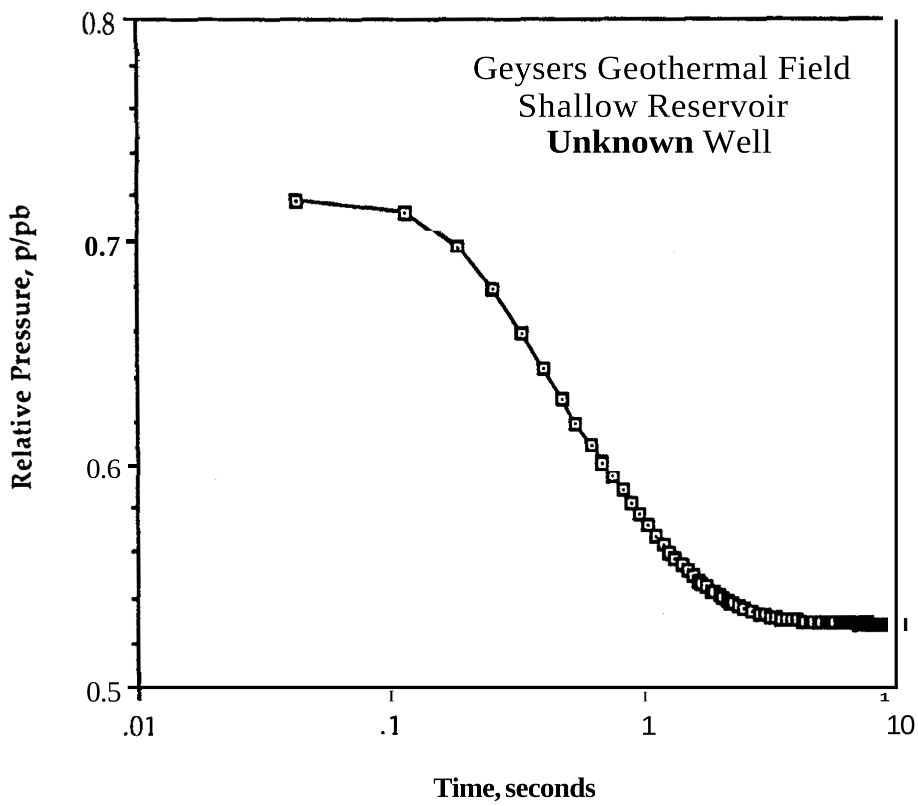

Figure 5.21: Pressure at the Closed End of the sample for the Geysers Shallow Reservoir, Unknown Well, Particles Between 0.583 and 0.104 mm

The permeability was measured after the run. Permeabilities were determined at pressure differences of 4.05, 3.05 and 2.05 psi. The Klinkenberg effect was removed and the permeability to liquid was found to be 21.3 darcys. The sample weighed 116.780 grams.

The fourth run on the transient apparatus was with a sample recently obtained from UNOCAL Geothermal. The sample is a mixture of graywacke well cuttings from the Geysers well OF52-11 covering the depths 5000 to 5200 feet. The particles were much finer than the particles of the Reykjanes sample which was also well cuttings. The sample was washed with tap water and dried at room temperature for two days. The sample was sieved and that which passed through the No. 10 and retained on the No. 150 sieve was packed into the one-inch diameter holder.

Steam was allowed to adsorb onto the sample for approximately 36 hours. The transducers in the air bath were calibrated at 15 psig, and 14.7 psia was assumed to be the atmospheric pressure. The pressure decline at the top of the sample is shown in Figure 5.23.

Permeability was measured at pressure differences of 3.95, 2.95 and 1.95 psi. The measurements were made with the holder in a vertical orientation. The Klinkenberg effect was removed and the permeability to liquid was found to be 13.7 darcys. The weight of the sample was measured in two increments and found to be 214.567 grams.

At the time of this report, problems in linking the regression program and the transient finite-difference simulator arose. Regression using the program of Qi and Horne was not performed on the data. However, using the last transient run, a visual match was made varying the Langmuir constants in the transient finite-difference program. The pressure versus time match is presented in Figure 5.23. The parameters were 30 for a and 84 for b A desorption isotherm was produced using these two constants. Figure 5.24 compares the derived desorption isotherm with the measured sorption isotherm for the same sample at 100 C. The match is not very good, although the pressure match in Figure 5.23

is quite good. This appears to indicate that the pressure-time data in Figure 5.22 is not adequate for precise determination of the desorption isotherm.

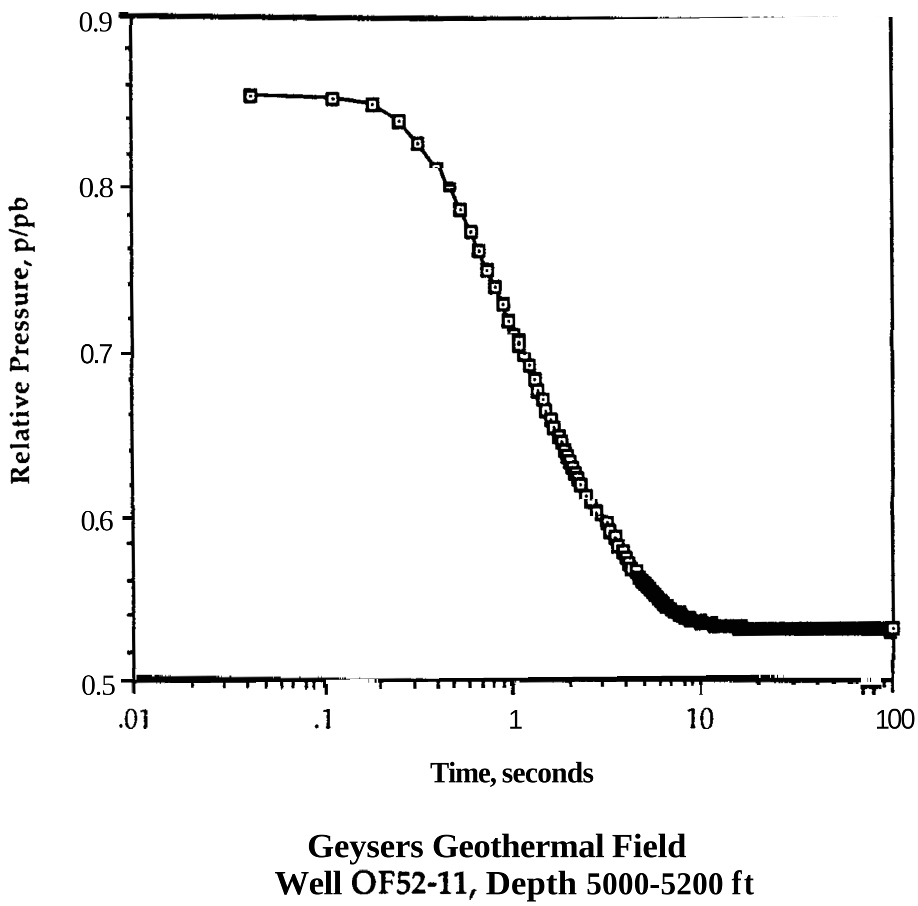

Figure 5.22: Pressure at the Closed End of the sample for the Geysers Geothermal Field, Well OF52-11 Depth 5000 to 5200 ft

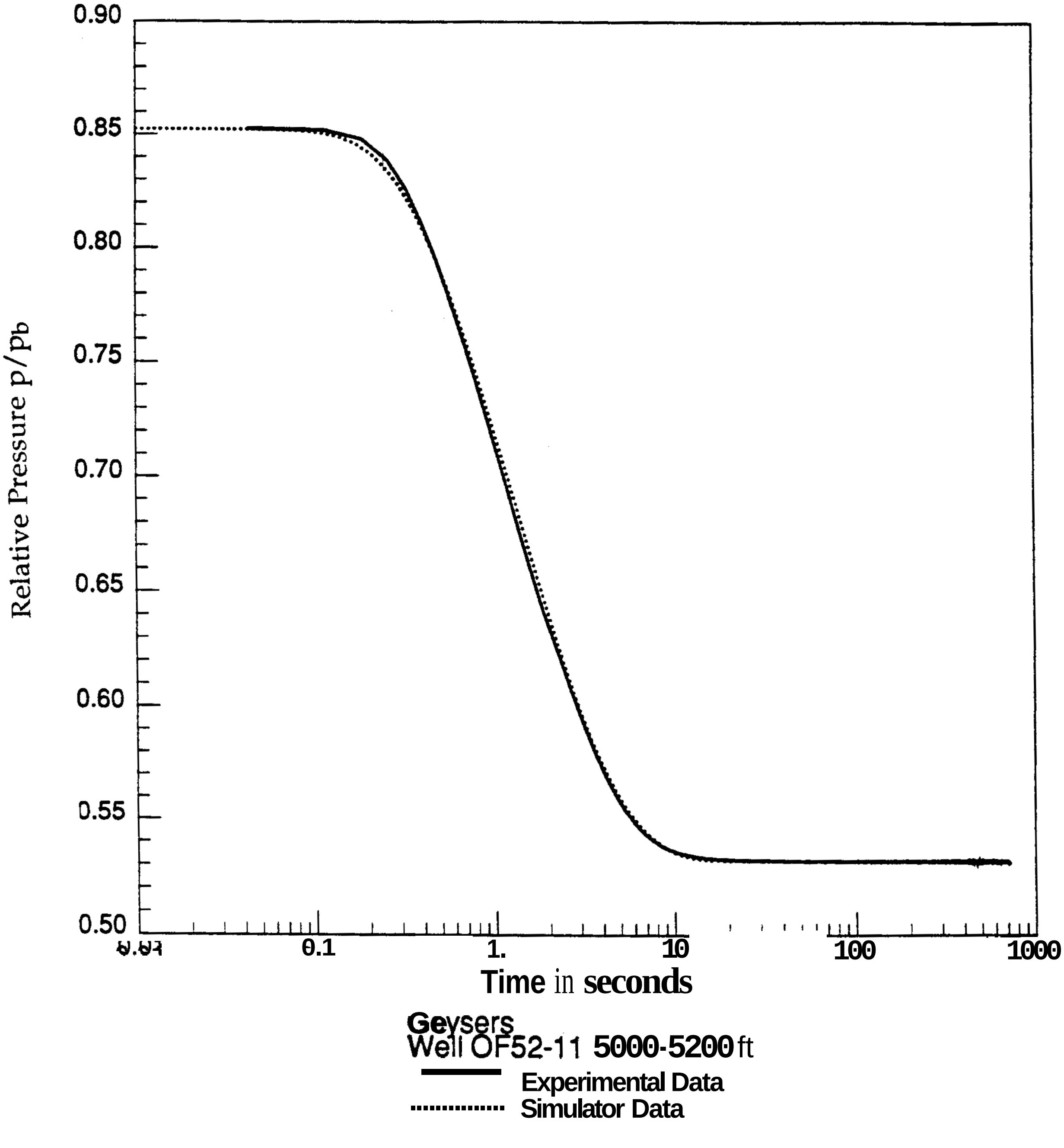

Figure **5.23:** Pressure Decline at the Closed End for the Geysers Geothermal Field, Well OF52-11 Depth 5000 to 5200 ft)

Figure 5.23: Pressure at the Closed End of the sample for the Geysers Geothermal Field, Well OF52-11 Depth 5000 to 5200 ft.

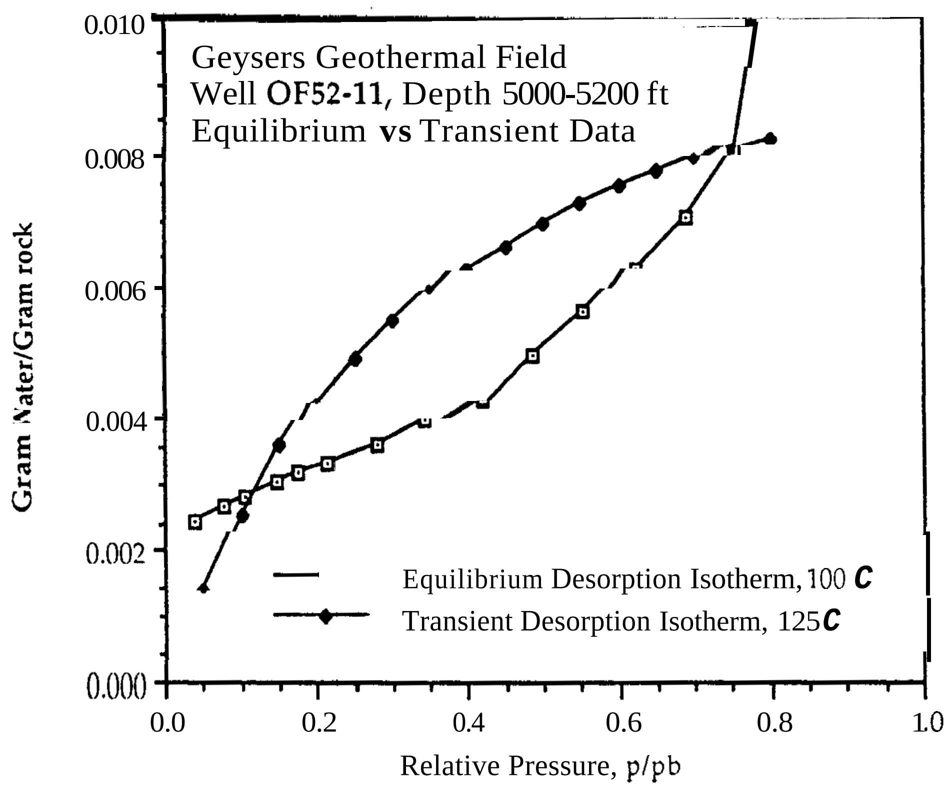

Figure 5.24: Comparison of Sorption isotherms derived from equilibrium and transient methods for the Geysers Well OF52-11 5000-5200 ft.

Section 6

Conclusions and Recommendations

6.1 Conclusions

1. **A** study of equilibrium times for the PMI Sorptometer demonstrates that a time of 30 seconds is sufficient for the samples used. The PMI Sorptometer determines equilibrium by the rate of pressure change.

2. Crushing rock material or using well cuttings does not appear to add significant surface area to a sample. Measurements performed on samples of sizes greater than 2.362 millimeters and on samples less than 0.104 millimeters showed a difference of 5 percent when the maximum amount adsorbed was compared.

3. Adsorption and desorption isotherms measured at different temperatures were different and did not agree with each other.

4. A large hysteresis was found between adsorption and desorption.

6.2 Recommendations

1. **A** comparison of adsorption and desorption isotherms for samples of different particle sizes was performed for one sample from the Geysers shallow reservoir. This analysis was not general. Surface area measurements should be made for crushed and solid samples.

2. Sorption Isotherms on the same sample but at different temperatures did not compare well. Hsieh (1980) found that results could be correlated by using the activity coefficient. This method should be tested to see if the data can be normalized. **A** comparison of results from Hsieh's apparatus and the PMI Sorptometer should be made.

3. Samples on the transient apparatus depleted faster than expected. Increasing the core holder length to 45 centimeters, or using a holder of 0.75 inch diameter and 60 centimeters in length would increase the desorption time and would only require 105.4 cubic centimeters of sample for a length of 45 cm and 140.5 cubic centimeters for a length of 60 centimeters. The one-inch holder requires 131.5 cubic centimeters.

4. Transient experiments were carried out at 125 *C*. Increasing the air bath temperature to 140 *C* would increase the pressure difference and improve the accuracy of pressure measurement.

5. Transient experiments were vented to the atmosphere. Future experiments should be vented to a vacuum. By doing so, a greater pressure drop would be employed which would cover more of the desorption isotherm. In addition, the steam desorbed should be condensed providing a check on the total amount of steam adsorbed.

List of Symbols

a	Langmuir Isotherm constant, dimensionless
b	Langmuir Isotherm constant, dimensionless
c_g	Gas compressibility
g	Gravitational constant
k	Permeability
M	Molecular weight
$m(p)$	Real gas potential of Al-Hussainy et al. (1966)
p	Pressure
p_{init}	Initial pressure in the core filled with steam
p_b	Saturated vapor pressure
p_{out}	Outlet pressure of the pressure transient equipment
R	Gas law constant
t	Time
T	Temperature
X	Adsorption (gm H_2O/gm rock)
z	Gas deviation factor
μ	Viscosity
ρ_r	Rock density
ρ_s	Steam density
ρ_w	Liquid water density
ϕ	Fractional porosity

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Appendix A

Transient Flow Equipment Description and Manual

The transient flow system is composed of four subsystems: the air bath system, the vacuum system, the steam generator and the computer. Each system and the operation will be described individually. The procedure for making a transient run will also be described.

A.1 The Air Bath System

The air bath system consists of the air bath, the rock sample and the valving necessary for adsorbing gases in and desorbing gases out of the sample. The air bath is a Blue M model FA-1402EF6, which is a forced air circulation bath as opposed to a heating element air bath. A diagram of the equipment is presented in Figure A.1. All valves are stainless steel and pneumatically operated outside of the air bath from a control panel. The air bath temperature should never exceed 150 C. Excessive heating caused the O-rings in the pneumatic valves to acquire a permanent set and require replacement. Replacing the O-rings is a time-consuming process.

The air bath is connected to three other major subsystems. The vacuum system is connected by the lines into valves 0-5 and 0-7. Vacuum, atmospheric pressure and pressure from a dead weight tester can be applied through these valves. The steam from the external generator enters the four-way connection with valves 0-3, 0-4 and 0-5. The steam can be controlled from a valve, S-1, at

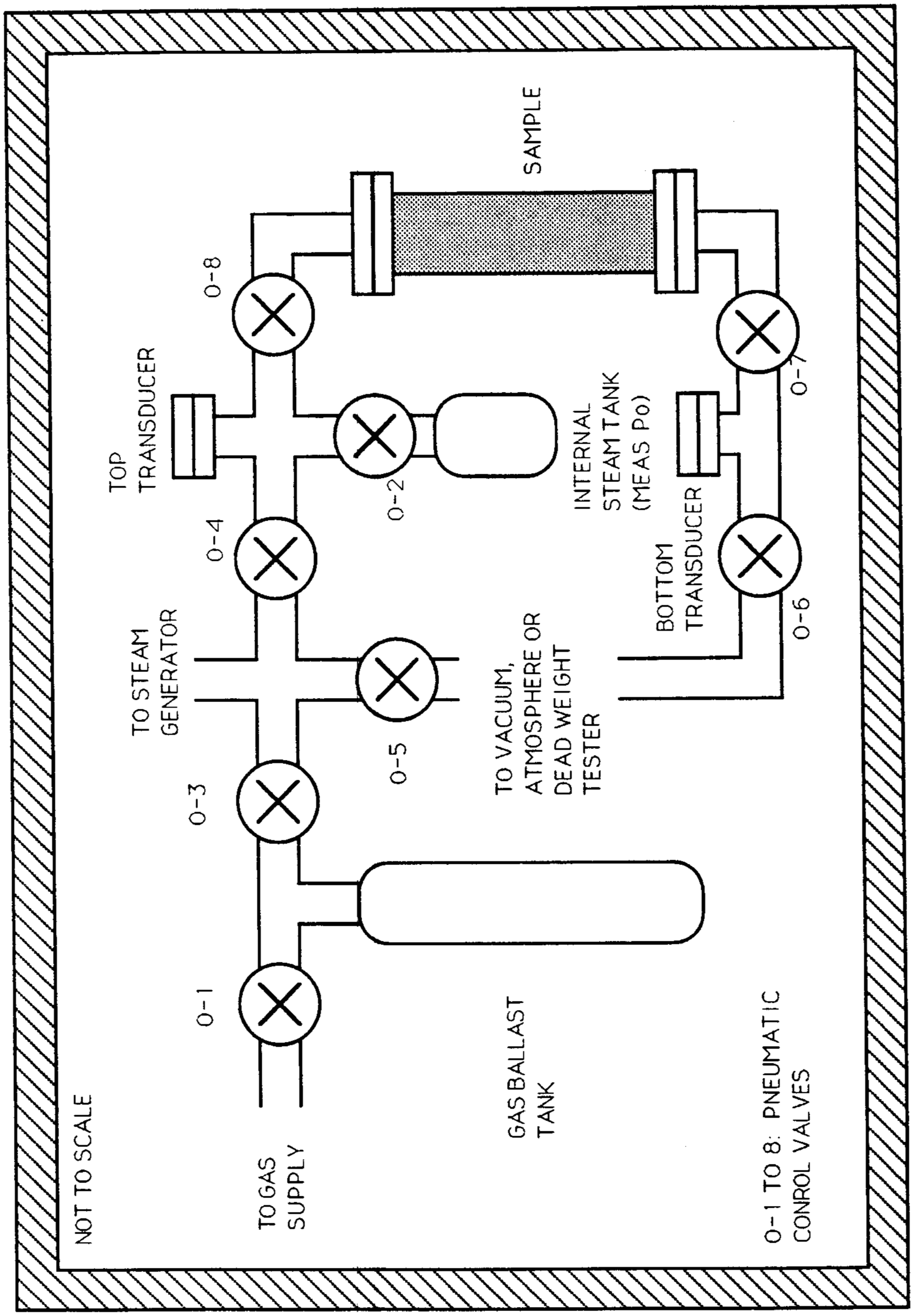

Figure A.l: Diagram of Transient Model Air Bath **and** Components.

the fluidized bath. This system will be described in detail in the following section. The transducers are connected to a signal conditioner and a computer. **A** transducer is located on the air line controlling valve 0-6. This signals the computer that the sample is open and to begin to take data.

Gases (nitrogen or methane) to be used for adsorption and desorption experiments should be connected to the line from valve O-1 to outside the air bath. **A** one gallon stainless steel tank is located between valves O-1 and 0-3, so that gases can be brought to air bath temperature for adsorption experiments.

Inside the air bath is a 1000 cc stainless steel water reservoir. This chamber can be opened to the upper transducer and the pressure measured. This will be an accurate measure of the saturated vapor pressure at the air bath temperature.

A.2 The Vacuum System

The vacuum system, shown in Figure **A-2,** comprises a vacuum pump, a glass vacuum trap and a vacuum manifold. Two valves separate the three components. During operation, the vacuum trap is immersed in liquid nitrogen. This condenses all water in the trap and keeps the vacuum pump oil clean. This improves the quality of the vacuum which is essential for calibrating the pressure transducers, and removing water and gases from the sample prior to adsorbing the gas or vapor of interest.

The vacuum system can be turned on by the following procedure.

1. Close relief valve above the pump, valve **V-3.**

2. Turn on the vacuum pump.

3. Immerse the vacuum trap in liquid nitrogen.

4. Open the valves connecting the manifold, trap and pump, valves **V-1** and **V-2.**

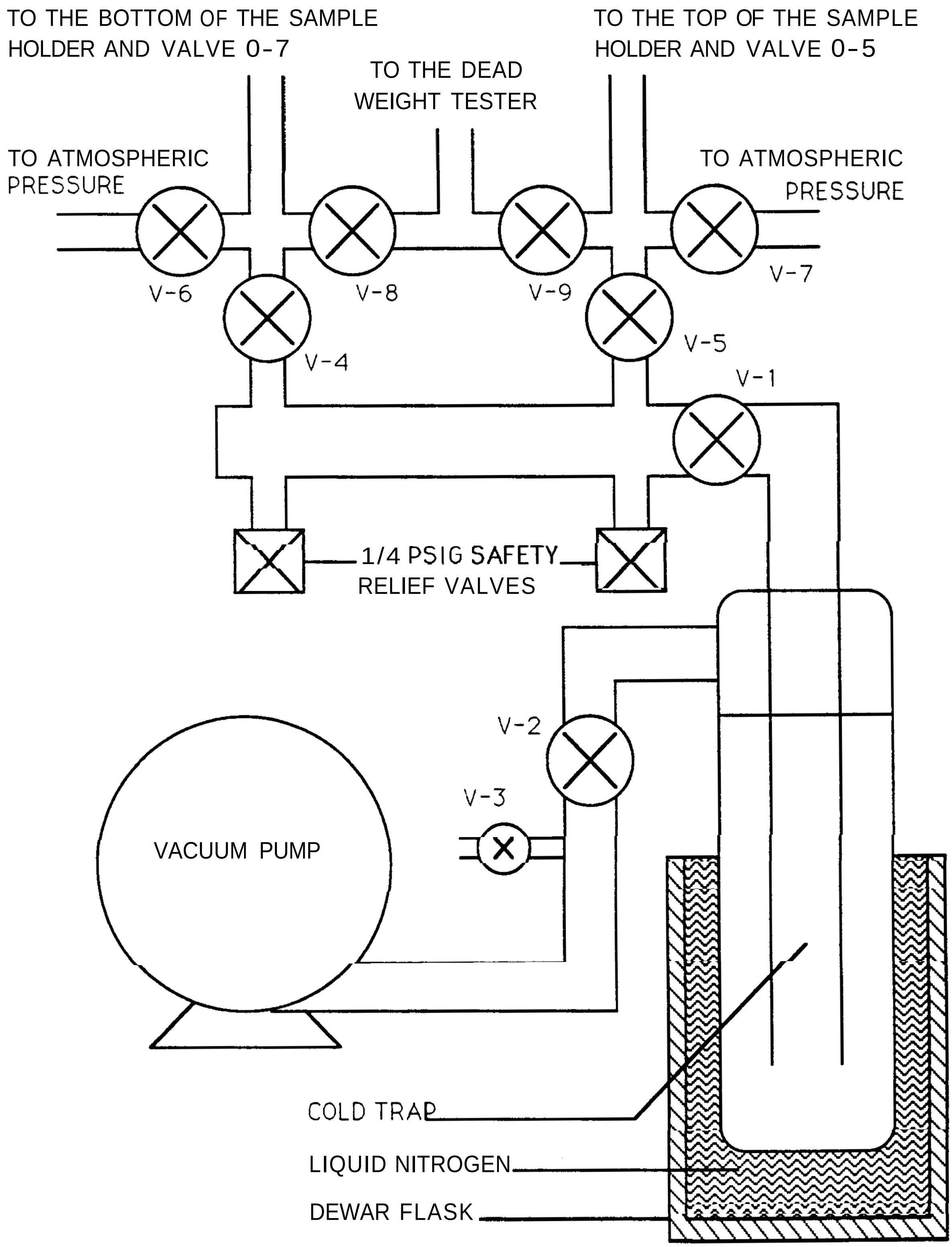

Figure **A.2:** Diagram of Transient Model Vacuum System.

The vacuum system can be turned off by reversing the above procedure and by removing the liquid nitrogen from the trap and immersing the trap in room temperature tap water.

During operation, the vacuum trap will accumulate water. The trap should be cleaned regularly to prevent water from entering the vacuum pump. To remove the water, loosen the lower half of the trap by turning. Remove the trap and pour out the water. Dry the trap before placing the lower half in the original position.

Included in the vacuum system are the valves to apply vacuum, atmospheric and dead weight tester pressure to the air bath system and the pressure transducers in particular. To apply a vacuum, make certain valves **V-6** through 9 are closed, and open valves **V-4** and **V-5.** To apply atmospheric pressure, close valves **V-4, V-5, V-8** and V-9, and open valves **V-6** and **V-7.** To apply a pressure from the dead weight tester, connect the dead weight tester at the tester port, close valves **V-4** through 7, and open valves **V-8** and V-9.

A.3 The Steam Generator

The source of steam is external. **A** diagram of the system used to generate steam is given in Figure **A.3.** Distilled water is contained in a stainless steel tank which is immersed in a Texcam SBL-2D fluidized bath. **A** one-quarter inch line was connected from the lab compressed air to the fluidized bath to supply air.

To avoid condensation, the steam temperature should be below the air bath temperature. The temperature of the air bath is controlled by a Texcam TC4D temperature controller. **A** fan was situated near the temperature controller. The controller contains electronic parts and is very heat sensitive. The controller location near the air bath and the fluidized bath places the controller close to a strong heat source. The fan is used to reduce the heat near the controller and thus obtain a stable temperature from the fluidized bath.

There are three lines into or out of the stainless steel tank. The first is a one-half inch line to the air bath. **A** heated wire is wrapped around this line and insulation around the heating wire and pipe. The line is maintained at a

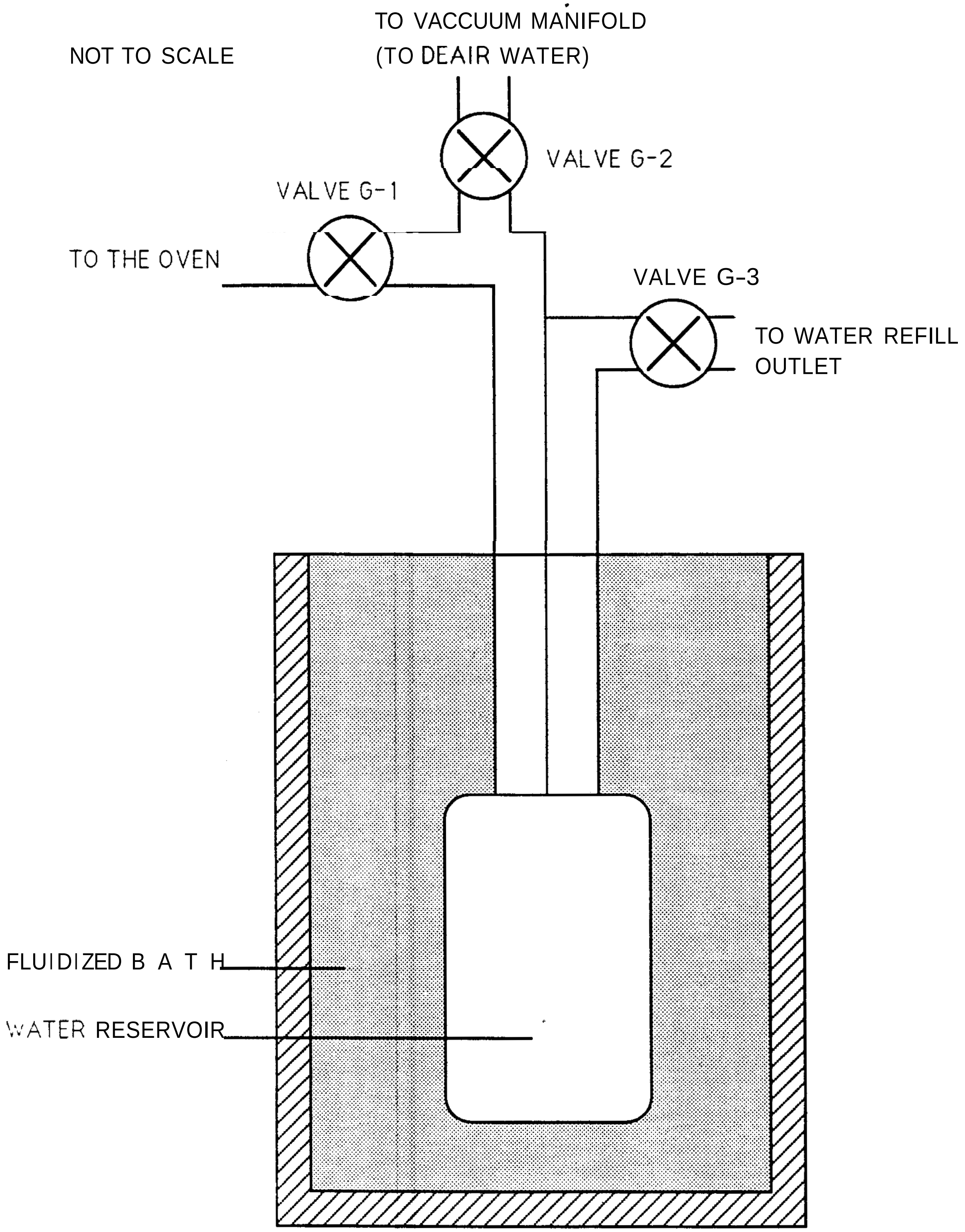

Figure A.3: Diagram of Transient Model Steam Generation System.

temperature near that of the air bath while steam is passing from the tank to the sample to prevent condensation. To open the steam tank to the air bath, open valve S-1.

There is a one-quarter inch line from the tank to the vacuum manifold. Opening and then immediately closing valve V-2 in this line will remove air which may have leaked into the tank. At all other times, this valve should remain closed. There is a one-quarter inch line from the tank provided to refill the tank whenever it is depleted. The tank should be filled with deairated distilled water. To replenish the water, open valve V-3, inject water into the tank, close valve V-3, and open valve V-2 to remove any air that may have entered the system.

A.4 The Data Recording System

A computer system with programs written specifically for the transient model were included in the equipment. The Computer System included a Digital PDP-11 processor, a Digital RX02 floppy disk drive, a Digital RL02 hard disk drive, Bell and Howell signal conditioner and a VT105 monitor and key board.

The computer can be turned on by following the procedure:

1. Turn on the power to all of the equipment.

2. Press the LOAD button on the hard drive. Wait for the ready light to illuminate.

3. Type DL and RETURN. This command will boot the computer. Wait for the computer to finish booting.

4. Enter the date, by typing DA DA-MON-YR. For example, June 12, 1990 is 12-JUN-90.

5. Enter the time by typing TI HR:MN. For example, 1:30 PM is 13:30.

The program used to record the transient run will not run unless the day and time have been entered.

The are three programs of interest. The programs can be accessed by typing the program names after the '.' prompt. **ADT** lists the potential across the bottom and the top transducers, and keeps a running average of the values. The first three columns on the left list the data point number, the time and the date. The four columns on the right list the voltage across the transducers and their running average. Of these four columns, the left two are the instantaneous and average of the bottom transducer, and the right two columns are the instantaneous and average for the top transducer. There are two useful commands to remember inside the ADT program. Typing an **'A'** begins a new average of the voltages after the 'A' is entered. Typing an 'S' exits the program and returns to the '.' prompt.

The program PTDT records a pressure transient run. After typing PTDT, the program will prompt the user for parameters to run the test, and record the data. PTDT puts the raw output in machine language into a file with the date and the run number that date as the name. The program DRWDWN takes the raw output from the PTDT program and converts it to ASCI form. Input of the parameters recorded before and after the run are required.

To Turn off the computer:

1. Push the load button to the out position. Wait for it to illuminate. This allows this disk time to spin down.

2. Turn the power off.

A.5 Making a Run

The following procedure describes the tasks to be performed to make a transient desorption run. The procedure need not be followed exactly. However, for the best results it is recommended that it be followed closely. All tasks have been described previously, such as turning on the vacuum system.

1. Pack the sample holder.

2. Place the sample holder in the air bath and attach inlet and outlet lines.

3. Turn on the vacuum system.

4. Open the sample to the vacuum. Open valves V-4, V-5, 0-4, 0-5, O-6, 0-7 and 0-8

5. Turn on the air bath.

6. Turn on the steam generator.

Allow the system at least eight hours to equilibrate. It is important to put the system on vacuum before turning on the air bath. Pressures inside the tubing will rise once the air bath is on. If the valves are closed, the pressures near the pressure transducers may exceed the transducer rated pressure, and fatigue the pressure sensor plate. Once the system has reached a steady state temperature, the sample can be flooded with steam by the following procedure.

7. Turn on the heated coil around the tubing from the steam generator to the air bath.

8. Close valves 0-5, 0-7, V-4 and V-5. Valves 0-4, 0-6 and 0-8 remain open.

9. Valve G-2 should be opened and then immediately closed. This opens the steam reservoir to vacuum. The purpose is to remove air that may have leaked into the water reservoir. However, leaving the valve open too long will allow water to enter the vacuum pump and reduce pump efficiency. Repeat this rapid opening and closing a few times to ensure that no air remains in the steam reservoir.

10. Open valve G-1. This will open the steam generator reservoir to the sample top. G-1 should be left open until the pressure at the bottom of the sample is the same as the pressure as the top, and both pressures are stable. The

sample will now be adsorbing steam. It may take several hours for the steam to adsorb. Eight to ten hours should be sufficient. Once the sample has adsorbed the steam, calibration of the transducers and prerun data can be recorded.

11. Turn on and boot up the computer. Follow the instructions listed previously.

12. On the computer, enter the ADT program by typing 'ADT' after the '.' prompt. The program will ask "Which one of these?" followed with a listing of 9 choices. Type either a '0' or a '1' once inside the program. A '0' will list a reading every 1000 data points, and a '1' will list a reading every 3000 data points.

13. Connect a dead weight tester to the dead weight tester port.

14. Open valves V-9, 0-4 and 0-5. Apply a known pressure with the dead weight tester.

15. Record the pressure and the voltage across the top transducer.

16. Close valve V-9. Open valve V-7 to bleed the pressure. Close valve V-7 and open V-5 to evacuate the pipe adjacent to the top transducer.

17. Open valves V-8 and 0-7. Apply the same pressure to the bottom transducer.

18. Record the voltage across the bottom transducer.

19. Close valve V-8. Open valve V-6 to bleed pressure. Close Valve V-*6* and open valve V-4 to evacuate the pipe adjacent to the transducer.

20. Close valve 0-4. Open valve 0-2. This opens the top transducer to the air bath's internal water reservoir. This provides an accurate measure of the saturated vapor pressure, and thus the temperature inside the air bath.

21. Record the voltage on the top transducer.

22. Close valve 0-2. Open valve 0-4 to evacuate the pipe adjacent to the top transducer.

23. Close valves 0-4 and 0-5. Open valves 0-6 and 0-8. This will allow the measurement of the initial pressure inside the sample.

24. Record the voltage across the top and the bottom transducer.

25. Close valves 0-6 and 0-8.

26. Open valves 0-4, 0-5 and 0-7. Evacuate the pipe around the transducers. Wait for the pressure to drop and stabilize. This will provide a measurement of the voltage at near zero pressure.

27. Record the voltage across the top and bottom transducers.

The run can now be made.

28. Close valves 0-4, 0-5, V-4 and V-5. Open Valves V-6 and 0-8.

29. Enter the program PTDT by typing 'PTDT' after the prompt.

30. The program will ask a series of questions.

- Are "6" & "7" the data translation channels to be used? (1/0) Answer 1.
- Is "50" octal=1/2 the data sample? (1/0) Answer 1
- Is "1005=1000" x the log time factor? (1/0) Answer 1.
- Repeat A/D write cycle? (1/0) Answer 0.

An output file will be listed on the screen. It will be named for the date, example 13AG91.PT1 is the first file on August **13,** 1991. It should be recorded for future use. A prompt to open valve 6 will appear on the screen.

31. Open valve O-6. Opening begins the test. The program will continue recording data until any key is pressed, or for approximately 40 minutes if no key is pressed.

Post test parameters must be recorded at this time.

32. Close valves 0-6 and *0-8.* Open valves **0-4,** 0-5 and **V-7.** Both transducers are now open to the atmosphere.

33. Record the voltage across the top and bottom transducers.

34. Close valves **V-6** and **V-7.** Open valves **V-4** and **V-5.** Wait for the vacuum pressure to drop and stabilize.

35. Record the voltage across the top and bottom transducers.

The data can now be reduced and put into **ASCI** format.

36. Enter the program DRWDWN by typing it after the prompt. The program will ask a series of questions.

- Steam charge in net volts? Enter the voltage recorded at the top and bottom of the sample chambers minus the vacuum voltage.

- What is pzero, net volts? Enter the voltage when the air bath's internal steam reservoir was open minus the vacuum voltage.

- What is the calibration voltage, net volts? Enter the voltage across the top and bottom transducers when the pressure from the deadweight tester was applied minus the vacuum voltage.

- Is the calibration pressure=1.998 bars? (1/0) Entering 1 is yes and the program will continue. Enter 0 and the program will prompt you for the pressure in bars.

- What is the raw atmospheric pressure, volts? Enter the voltage across the bottom and top transducers after the run.

- What is the raw vacuum voltage ? Enter the vacuum voltage across the bottom and top transducers.

- What is the logtime progression factor? Answer 1005.

- How many samples per data point? Answer 40.

The program will write two new files to the disk. The files will have the same name as the raw data file with the PT1 replaced with **AS1** and UF1. The AS1 file is in ASCI form, and can either be edited on the PDP-11 or transferred to another computer. Conversations with W. Herkelrath indicate that the file could be transferred to Pangea easily. However, this was never tried. Files for this report were taken to the USGS where they were transferred to a Macintosh.

Appendix B

Experimental Data

B.1 Equilibrium Data

Geysers Shallow Reservoir
Unknown Well

Final Equilibrium Time	30	sec
Temperature	100	C
Saturation Pressure	14.696	psia
Sample	Core	

	Pressure psia	Vol. Adsorbed cc/gm
Adsorption		
	9.415	3.666556
	8.655	3.395131
	8.389	3.287234
	7.579	3.020301
	7.237	2.892491
	6.599	2.586566
	6.315	2.428913
	5.685	2.114773
	5.375	1.940148
	4.802	1.613863
	4.482	1.420338
	3.870	1.096117
	3.416	0.9020301
	2.842	0.715346
	2.064	0.5489531
	1.492	0.4285785
	0.594	0.250776
Desorption		
	9.415	3.666556
	8.547	3.49933
	8.137	3.409061
	7.413	3.260038
	6.815	3.114301
	6.503	3.038812
	6.215	2.965629
	5.691	2.848522
	5.439	2.784724
	5.211	2.72074
	4.652	2.583227
	4.464	2.528066
	4.318	2.468522
	3.538	2.222922

3.468	2.167925
3.388	2.115926
3.308	2.064576
2.606	1.895537
2.042	1.764401
1.594	1.662782
1.246	1.583172
0.988	1.51841
0.82	1.469691
0.676	1.422404
0.578	1.384343
0.506	1.359984
0.418	1.330691
0.362	1.303463
0.314	1.279805
0.302	1.258586
0.286	1.240191
0.28	1.22298
0.27	1.207866
0.266	1.193415

Geysers Shallow Reservoir		
Unknown Well		
Final Equilibrium Time	300	sec
Temperature	100	C
Saturation Pressure	14.696	psia
Sample	Core	

	Pressure psia	Vol. Adsorbed cc/gm
Adsorption		
	9.563	3.778782
	9.129	3.617062
	8.693	3.452836
	8.251	3.286528
	7.849	3.111534
	7.381	2.944484
	6.969	2.762489
	6.585	2.577536
	6.197	2.389607
	5.879	2.189982
	5.503	1.997115
	5.183	1.792926
	4.832	1.592651
	4.486	1.39047
	4.072	1.198594
	3.616	1.012654
	3.059	0.8420745
	2.442	0.6789788
	1.722	0.5312325
	0.934	0.3914251
	0.238	0.2342945
Desorption		
	9.563	3.778782
	9.031	3.683697
	8.573	3.583051
	8.141	3.488238
	7.405	3.331176
	6.749	3.186056
	6.399	3.11248
	5.631	2.946477
	5.361	2.880801
	4.756	2.733979

4.376	2.631926
3.502	2.398276
3.412	2.342951
3.302	2.292066
2.652	2.114094
2.034	1.988696
1.538	1.896576
1.178	1.824207
0.884	1.772145
0.668	1.732267
0.542	1.700303
0.394	1.678744
0.304	1.659899
0.254	1.648144
0.221	1.642469
0.195	1.642079

Geysers Shallow Reservoir
Unknown Well

Final Equilibrium Time	1000	sec
Temperature	100	C
Saturation Pressure	14.696	psia
Sample	Core	

	Pressure psia	Vol. Adsorbed cc/gm
Adsorption		
	9.593	3.881368
	9.305	3.697922
	8.351	3.323205
	7.101	2.802177
	6.267	2.384337
	5.207	1.744551
	4.546	1.344653
	3.698	0.9752208
	2.54	0.6472901
	1.776	0.5119111
	0.974	0.3779233
Desorption		
	9.593	3.881368
	8.328	3.596506
	7.22	3.349941
	6.24	3.139654
	5.161	2.893945
	4.225	2.639249
	3.416	2.407278
	2.161	2.106412
	1.633	2.008641
	1.294	1.940039
	1.01	1.891384
	0.791	1.847716
	0.483	1.795906
	0.252	1.750244

Geysers Shallow Reservoir		
Unknown Well		
Final Equilibrium Time		30 sec
Temperature		100 C
Saturation Pressure		14.696 psia
Sample		Core > 2.362 mm
	Pressure psia	Vol. Adsorbed cc/gm
Adsorption		
	13.833	26.03339
	11.063	8.241333
	10.189	6.812074
	9.683	5.863342
	8.291	5.000641
	7.301	4.023538
	6.781	3.321582
	5.955	2.752544
	5.469	2.308509
	4.592	1.893901
	3.434	1.449049
	2.772	1.276746
	1.356	0.8555682
	0.43	0.5681285
Desorption		
	13.833	26.03339
	13.587	25.75419
	13.212	25.19672
	12.59	24.12067
	11.506	15.01014
	10.47	12.25544
	9.57	10.9025
	8.867	9.90188
	7.609	9.010366
	6.415	8.39875
	5.48	8.001293
	4.498	7.649621
	3.257	7.440323
	2.318	7.297999
	1.663	7.193672
	1.261	7.116264
	0.773	7.010907

Geysers Shallow Reservoir		
Unknown Well		
Final Equilibrium Time	30	sec
Temperature	100	C
Saturation Pressure	14.696	psia
Sample	Core < 0.104 mm	

	Pressure psia	Vol. Adsorbed cc/gm
Adsorption		
	13.799	37.71032
	13.03	15.31705
	11.707	6.479061
	10.569	5.372429
	9.679	4.729094
	8.385	3.872003
	7.541	3.464563
	6.561	3.068887
	5.471	2.687506
	4.356	2.287506
	3.226	1.862527
	2.168	1.468736
	0.988	0.7996488
	0.652	0.5314551
Desorption		
	13.799	37.71032
	13.118	35.52597
	12.501	22.60163
	11.413	8.503961
	10.26	6.688451
	9.598	5.963518
	8.454	5.105705
	7.493	4.509759
	6.516	4.011947
	5.463	3.546872
	4.473	3.18612
	3.324	2.979643
	2.457	2.828976
	1.81	2.718807
	1.397	2.625013
	0.806	2.498241

Geysers Shallow Reservoir		
Unknown Well		
Final Equilibrium Time	30	sec
Temperature	140	C
Satuation Pressure	52.414	psia
Sample	Core < 0.104 mm	

	Pressure psia	Vol. Adsorbed cc/gm
Adsorption		
	40.219	56.94974
	34.333	5.668583
	30.211	3.628184
	24.63	2.951319
	19.362	2.408805
	15.064	2.018687
	9.609	1.492148
	4.932	1.078598
Desorption		
	40.219	56.94974
	34.816	21.96422
	28.252	3.887366
	24.612	3.510085
	20.357	3.067941
	14.659	2.563529
	10.243	2.151158
	5.155	1.878355

Geysers Shallow Reservoir
Unknown Well

Final Equilibrium Time	3Q sec
Temperature	100 C
Saturation Pressure	14.696 psia
Sample	Core > 2.362 mm

	Pressure psia	Vol. Adsorbed cc/gm
Adsorption		
	14.04	35.869
	11.473	5.816735
	10.741	4.308463
	10.123	3.442966
	9.391	2.953028
	8.593	2.546845
	7.581	2.180469
	6.199	1.799867
	5.319	1.605571
	4.4	1.412971
	3.422	1.225887
	2.416	1.039503
	1.656	0.8733734
	0.498	0.5720175
Desorption		
	14.04	35.869
	13.516	34.636
	12.48	14.05569
	11.85	10.38791
	11.009	8.579657
	10.088	7.41884
	9.411	6.364127
	7.992	5.361861
	6.895	4.83709
	5.615	4.367709
	4.633	4.081996
	3.107	3.917656
	1.941	3.840557
	1.254	3.782905
	0.824	3.742447

Geysers Reservoir		
Well OF52-11 5000-5200ft		
Final Equilibrium Time	30	sec
Temperature	100	C
Saturation Pressure	14.696	psia
Sample	Well Cuttings	

	Pressure psia	Vol. Adsorbed cc/gm
Adsorption		
	13.749	66.1876
	12.996	10.68132
	11.947	7.867047
	11.052	6.856943
	9.913	6.055879
	9.088	5.580827
	7.805	4.955796
	6.743	4.482358
	5.077	4.151227
	3.95	3.154537
	2.914	2.624804
	1.908	2.074931
	0.943	1.504844
Desorption		
	13.749	66.1876
	13.051	65.08792
	12.17	15.92466
	11.07	9.956621
	10.103	8.761989
	9.161	7.855068
	8.101	6.919923
	7.129	6.129409
	6.176	5.258359
	5.058	4.773345
	4.098	4.384146
	3.137	4.086752
	2.56	3.925991
	2.137	3.786927
	1.526	3.569785
	1.133	3.406615
	0.564	3.175664

Geysers Reservoir		
Well OF52-11 5000-5200ft		
Final Equilibrium Time	30	sec
Temperature	140	C
Saturation Pressure	52.414	psia
Sample	Core < 0.104 mm	

	Pressure psia	Vol. Adsorbed cc/gm
Adsorption		
	33.881	6.927242
	30.335	4.546304
	24.646	3.90204
	19.292	3.354285
	15.153	2.867357
	10.257	2.222929
	5.233	1.530135
Desorption		
	33.881	6.927242
	29.345	4.758015
	25.656	4.390662
	19.532	3.857341
	14.987	3.422893
	10.118	2.848827
	5.165	2.409208

Reykjanes No. 9
Iceland

Final Equilibrium Time	30 sec
Temperature	100 C
Saturation Pressure	14.696 psia
Sample	Well Cuttings

	Pressure psia	Vol. Adsorbed cc/gm
Adsorption		
	10.73	6.195225
	8.619	5.533649
	7.931	5.185852
	6.549	4.476647
	5.421	3.677609
	4.49	2.809923
	3.84	2.10732
	3.037	1.41237
	2.169	0.8836327
	1.457	0.660219
Desorption		
	10.73	6.195225
	8.868	5.962906
	7.926	5.726302
	7.152	5.498157
	6.266	5.190671
	5.109	4.775124
	4.155	4.334608
	2.895	3.523604
	1.887	3.123192
	1.022	2.759127

B.2 Transient Data

REYKJANES WELL 9

	Bottom	Top
The steam charge (volts):	0.415	0.6961
The steam charge (bars):	0.941965	1.71153
The steam charge (P/Pz):	0.500784	0.83999
The calibration (volts):	0.8992	0.8301
The pressure of the atmosphere (volts):	0.2653	0.5029
The pressure of the atmosphere (bars):	0.602177	1.2365
The vacuum reading (volts) after the run:	1.92E-02	1.92E-02
The saturated vapor pressure of water (volts):	0.8287	
The saturated vapor pressure of water (bars):	2.03756	
The temperature (degrees kelvin) is:	393.981	
The calibration pressure (bars):	2.041	
The geometric progression factor:	1005	
The # of samples per displayed point:	40	
The diameter of the sample (cm)	1.727	
The length of the sample (cm)	30.63	
The weight of the sample (gm)	110.195	
The permeability of the sample (darcys)	8	

	Time(sec)	Bottom(bars)	Top(bars)
1	4.29E-02	0.6089	1.6982
2	0.1141	0.61066	1.5861
3	0.1852	0.60597	1.4287
4	0.2562	0.60352	1.3209
5	0.3272	0.60337	1.2726
6	0.3982	0.60115	1.256
7	0.4693	0.60443	1.2515
8	0.5404	0.60453	1.249
9	0.6114	0.60317	1.2461
10	0.6825	0.60491	1.2449
11	0.7535	0.60398	1.2435
12	0.8245	0.60294	1.2425
13	0.8955	0.60271	1.2416
14	0.9667	0.60471	1.2413
15	1.038	0.60464	1.2406
16	1.109	0.6042	1.2402
17	1.18	0.60295	1.2398
18	1.251	0.60457	1.2397
19	1.322	0.60428	1.2395
20	1.393	0.6023	1.2386
21	1.464	0.6031	1.2389
22	1.535	0.60401	1.239
23	1.606	0.60203	1.2387

24	1.677	0.60386	1.2385
25	1.748	0.60459	1.2385
26	1.819	0.60323	1.2382
27	1.89	0.60375	1.2383
28	1.961	0.60346	1.2381
29	2.033	0.6069	1.2385
30	2.104	0.60333	1.2378
31	2.175	0.60316	1.2377
32	2.246	0.60427	1.2378
33	2.317	0.60518	1.2379
34	2.483	0.6043	1.2377
35	2.649	0.604	1.2373
36	2.816	0.60336	1.2373
37	2.983	0.60439	1.237
38	3.149	0.60497	1.2374
39	3.316	0.6031	1.2371
40	3.482	0.60388	1.2368
41	3.649	0.60387	1.2371
42	3.816	0.60241	1.2366
43	3.982	0.60348	1.2368
44	4.149	0.60366	1.2365
45	4.316	0.60529	1.237
46	4.482	0.6039	1.2369
47	4.649	0.6036	1.2366
48	4.816	0.60511	1.2365
49	4.982	0.60393	1.2367
50	5.149	0.60597	1.2367
51	5.316	0.60376	1.2365
52	5.482	0.60476	1.2366
53	5.649	0.60517	1.2367
54	5.816	0.60334	1.2366
55	5.982	0.60389	1.2363
56	6.149	0.60383	1.2365
57	6.316	0.60497	1.237
58	6.482	0.60398	1.2364
59	6.649	0.60311	1.2362
60	6.815	0.60436	1.2367
61	6.982	0.60482	1.2365
62	7.149	0.60284	1.2364
63	7.315	0.60348	1.2365
64	7.499	0.60299	1.2362
65	7.682	0.60349	1.2364
66	7.865	0.60484	1.2367
67	8.049	0.60456	1.2364

68	8.232	0.60378	1.2362
69	8.415	0.60455	1.2365
70	8.599	0.60375	1.2367
71	8.782	0.60348	1.2363
72	8.965	0.60505	1.2369
73	9.149	0.60457	1.2367
74	9.332	0.6047	1.2367
75	9.515	0.60368	1.2365
76	9.699	0.60428	1.2365
77	9.882	0.60403	1.2366
78	10.07	0.6034	1.2361
79	10.25	0.60363	1.2365
80	10.43	0.60434	1.2364
81	10.62	0.60386	1.2365
82	10.8	0.60409	1.2362
83	10.98	0.60382	1.2364
84	11.17	0.60447	1.2368
85	11.35	0.60481	1.2364
86	11.53	0.60525	1.2364
87	11.72	0.60352	1.2365
88	11.9	0.60369	1.2361
89	12.08	0.60325	1.2362
90	12.27	0.60342	1.2363
91	12.47	0.60395	1.2364
92	12.67	0.60371	1.2363
93	12.87	0.60397	1.2365
94	13.07	0.60412	1.2362
95	13.27	0.603	1.2364
96	13.47	0.60301	1.2359
97	13.67	0.6038	1.2362
98	13.87	0.6038	1.2363
99	14.07	0.6032	1.236
100	14.27	0.60389	1.2364
101	14.47	0.60385	1.2363
102	14.67	0.60362	1.2362
103	14.87	0.60316	1.2361
104	15.07	0.60274	1.2361
105	15.27	0.60357	1.2361
106	15.47	0.60424	1.2362
107	15.67	0.60366	1.236
108	15.87	0.60259	1.2362
109	16.07	0.60411	1.2361
110	16.27	0.60366	1.2364
111	16.47	0.60411	1.2364

112	16.67	0.60333	1.2361
113	16.87	0.60442	1.2364
114	17.07	0.60419	1.2365
115	17.28	0.60317	1.236
116	17.5	0.60338	1.236
117	17.72	0.60453	1.2363
118	17.93	0.60483	1.2365
119	18.15	0.60424	1.2362
120	18.37	0.60512	1.2363
121	18.58	0.60351	1.2361
122	18.8	0.60304	1.2362
123	19.02	0.60457	1.2364
124	19.23	0.60346	1.2361
125	19.45	0.60388	1.2364
126	19.67	0.60479	1.2363
127	19.88	0.60385	1.2361
128	20.1	0.60322	1.2361
129	20.32	0.60364	1.2362
130	20.53	0.60394	1.2363
131	20.75	0.60369	1.2361
132	20.97	0.6034	1.2361
133	21.18	0.60486	1.2366
134	21.4	0.604	1.2362
135	21.62	0.60385	1.2364
136	21.85	0.60323	1.2367
137	22.08	0.60408	1.2362
138	22.32	0.60491	1.2368
139	22.55	0.60346	1.2362
140	22.78	0.60361	1.2364
141	23.02	0.60315	1.2362
142	23.25	0.60325	1.2363
143	23.48	0.60364	1.2362
144	23.72	0.60338	1.2362
145	23.95	0.60457	1.2364
146	24.18	0.60438	1.2364
147	24.42	0.60481	1.2364
148	24.65	0.60419	1.2362
149	24.88	0.60311	1.2361
150	25.12	0.60379	1.2363
151	25.35	0.60325	1.2362
152	25.58	0.60309	1.2361
153	25.82	0.60422	1.2365
154	26.05	0.60337	1.2361
155	26.3	0.60411	1.2365

156	26.55	0.60396	1.2362
157	26.8	0.60324	1.2361
158	27.05	0.60432	1.2362
159	27.3	0.60374	1.2363
160	27.55	0.60497	1.2363
161	27.8	0.6037	1.2365
162	28.05	0.60235	1.2359
163	28.3	0.60321	1.236
164	28.55	0.60398	1.2366
165	28.8	0.60421	1.2364
166	29.05	0.60429	1.2363
167	29.3	0.60334	1.2361
168	29.55	0.60327	1.2361
169	29.8	0.60265	1.236
170	30.05	0.60283	1.236
171	30.3	0.60431	1.2365
172	30.56	0.60481	1.2361
173	30.83	0.60431	1.236
174	31.1	0.60399	1.2362
175	31.36	0.60409	1.236
176	31.63	0.60319	1.2363
177	31.9	0.60345	1.236
178	32.16	0.60356	1.2359
179	32.43	0.60361	1.2364
180	32.7	0.60389	1.2361
181	32.96	0.60469	1.2364
182	33.23	0.60405	1.2361
183	33.5	0.60355	1.2361
184	33.76	0.60439	1.2363
185	34.03	0.60351	1.2363
186	34.3	0.60481	1.2365
187	34.56	0.60467	1.2361
188	34.83	0.60377	1.2359
189	35.11	0.60391	1.236
190	35.4	0.60415	1.2362
191	35.68	0.6029	1.2359
192	35.96	0.60393	1.2359
193	36.25	0.60283	1.236
194	36.53	0.60333	1.2362
195	36.81	0.60343	1.2361
196	37.1	0.6033	1.2361
197	37.38	0.60402	1.2358
198	37.66	0.60391	1.2362
199	37.95	0.60408	1.2361

200	38.23	0.60318	1.236
201	38.51	0.60398	1.2362
202	38.8	0.60423	1.2364
203	39.1	0.6045	1.2361
204	39.4	0.60283	1.2359
205	39.7	0.60324	1.236
206	40	0.60387	1.2362
207	40.3	0.60338	1.236
208	40.6	0.60296	1.2362
209	40.9	0.60295	1.236
210	41.2	0.60381	1.2359
211	41.5	0.60444	1.2365
212	41.8	0.60289	1.2358
213	42.1	0.60353	1.2363
214	42.4	0.60465	1.2361
215	42.7	0.60402	1.2362
216	43	0.60466	1.2361
217	43.31	0.60526	1.2363
218	43.63	0.60368	1.2362
219	43.95	0.60397	1.2365
220	44.26	0.60418	1.2361
221	44.58	0.60408	1.2365
222	44.9	0.60356	1.2361
223	45.21	0.60548	1.2363
224	45.53	0.60352	1.236
225	45.85	0.60335	1.236
226	46.16	0.60355	1.2359
227	46.48	0.6041	1.2363
228	46.8	0.60372	1.2363
229	47.11	0.60367	1.2361
230	47.45	0.60472	1.2365
231	47.78	0.60446	1.2362
232	48.11	0.60492	1.2364
233	48.45	0.60326	1.236
234	48.78	0.60307	1.2358
235	49.11	0.6035	1.2361
236	49.44	0.60365	1.2363
237	49.78	0.60471	1.2364
238	50.11	0.60417	1.2361
239	50.44	0.60369	1.2361
240	50.78	0.60505	1.2364
241	51.11	0.60343	1.2364
242	51.46	0.60321	1.236
243	51.81	0.60517	1.2363

244	52.16	0.60537	1.2363
245	52.51	0.60415	1.2363
246	52.86	0.60401	1.2363
247	53.21	0.60355	1.2358
248	53.56	0.60376	1.236
249	53.91	0.60398	1.2362
250	54.26	0.60369	1.2363
251	54.61	0.60372	1.236
252	54.96	0.60457	1.2363
253	55.31	0.60368	1.2362
254	55.68	0.60443	1.2366
255	56.04	0.60342	1.236
256	56.41	0.60385	1.2363
257	56.78	0.60383	1.2363
258	57.14	0.60435	1.2362
259	57.51	0.60471	1.2367
260	57.88	0.60329	1.2362
261	58.24	0.60313	1.2362
262	58.61	0.60346	1.236
263	58.98	0.60337	1.2365
264	59.34	0.60539	1.2366
265	59.73	0.60319	1.2361
266	60.11	0.60426	1.2361
267	60.49	0.60413	1.2361
268	60.88	0.60422	1.2361
269	61.26	0.60329	1.2359
270	61.64	0.6035	1.2363
271	62.03	0.60322	1.2359
272	62.41	0.60425	1.2363
273	62.79	0.60437	1.2359
274	63.18	0.60312	1.2361
275	63.58	0.60305	1.2361
276	63.98	0.60393	1.2364
277	64.38	0.60361	1.2364
278	64.78	0.60382	1.2364
279	65.18	0.60307	1.2362
280	65.58	0.60378	1.2362
281	65.98	0.60472	1.2362
282	66.38	0.60419	1.2363
283	66.78	0.60545	1.2366
284	67.18	0.60431	1.2361
285	67.59	0.60428	1.2362
286	68.01	0.60412	1.2361
287	68.43	0.60291	1.236

288	68.84	0.60432	1.2363
289	69.26	0.60282	1.2356
290	69.68	0.60309	1.2361
291	70.09	0.60422	1.2362
292	70.51	0.60421	1.2362
293	70.93	0.60453	1.236
294	71.36	0.60342	1.2362
295	71.79	0.6035	1.2358
296	72.23	0.60391	1.2362
297	72.66	0.6044	1.2361
298	73.09	0.60325	1.2358
299	73.53	0.60314	1.2362
300	73.96	0.60336	1.2363
301	74.39	0.60406	1.2362
302	74.83	0.60473	1.2364
303	75.28	0.60439	1.2364
304	75.73	0.60415	1.2361
305	76.18	0.60505	1.2362
306	76.63	0.60379	1.236
307	77.08	0.60573	1.2366
308	77.53	0.60324	1.2361
309	77.98	0.60314	1.236
310	78.43	0.6033	1.2363
311	78.89	0.60346	1.236
312	79.36	0.60413	1.2362
313	79.83	0.60489	1.2368
314	80.29	0.60438	1.2363
315	80.76	0.60373	1.2361
316	81.23	0.60372	1.2361
317	81.69	0.60241	1.236
318	82.16	0.60449	1.2362
319	82.63	0.60401	1.2363
320	83.11	0.60368	1.2362
321	83.59	0.60259	1.2357
322	84.08	0.60326	1.2359
323	84.56	0.60578	1.2364
324	85.04	0.60479	1.2364
325	85.53	0.60308	1.2358
326	86.01	0.60506	1.2363
327	86.51	0.60534	1.236
328	87.01	0.60338	1.236
329	87.51	0.60323	1.236
330	88.01	0.60455	1.2363
331	88.51	0.60233	1.2361

332	89.01	0.60269	1.2359
333	89.51	0.6047	1.2364
334	90.01	0.60336	1.2362
335	90.53	0.60346	1.2363
336	91.04	0.60251	1.2359
337	91.56	0.60221	1.2359
338	92.08	0.60391	1.2363
339	92.59	0.60389	1.2362
340	93.11	0.60518	1.2365
341	93.63	0.6036	1.2363
342	94.16	0.60354	1.2363
343	94.69	0.60381	1.2363
344	95.23	0.60529	1.2367
345	95.76	0.60191	1.2362
346	96.29	0.60456	1.2363
347	96.83	0.60425	1.2365
348	97.36	0.60433	1.2362
349	97.91	0.6046	1.2364
350	98.46	0.60358	1.2361
351	99.01	0.60449	1.2362
352	99.56	0.60402	1.2364
353	100.1	0.60466	1.2364
354	100.7	0.60451	1.2365
355	101.2	0.60519	1.2362
356	101.8	0.60364	1.2362
357	102.3	0.60281	1.2361
358	102.9	0.60472	1.2368
359	103.5	0.60432	1.2363
360	104	0.60368	1.2362
361	104.6	0.60548	1.2367
362	105.2	0.60299	1.2362
363	105.8	0.60259	1.2361
364	106.3	0.60469	1.2363
365	106.9	0.60357	1.2361
366	107.5	0.60222	1.2361
367	108.1	0.60311	1.2364
368	108.7	0.6042	1.2367
369	109.3	0.6038	1.2362
370	109.9	0.60414	1.2361
371	110.5	0.60379	1.2365
372	111.1	0.60429	1.2362
373	111.7	0.60505	1.2363
374	112.3	0.60357	1.2363
375	112.9	0.60249	1.236

376	113.5	0.60358	1.236
377	114.1	0.60333	1.2365
378	114.7	0.6042	1.2364
379	115.4	0.60462	1.2368
380	116	0.60464	1.2365
381	116.6	0.60252	1.2362
382	117.2	0.60276	1.2362
383	117.9	0.60492	1.2366
384	118.5	0.60179	1.2361
385	119.1	0.60316	1.2359
386	119.8	0.6033	1.2361
387	120.4	0.60356	1.2364
388	121.1	0.60255	1.2363
389	121.7	0.60311	1.2361
390	122.4	0.60307	1.2365
391	123	0.60148	1.2361
392	123.7	0.60336	1.2362
393	124.3	0.60359	1.2364
394	125	0.60396	1.2364
395	125.7	0.60432	1.2365
396	126.3	0.60369	1.2362
397	127	0.60254	1.2358
398	127.7	0.60328	1.2364
399	128.4	0.60294	1.2363
400	129.1	0.60531	1.2365
401	129.7	0.60197	1.236
402	130.4	0.60334	1.2359
403	131.1	0.60446	1.2362
404	131.8	0.59985	1.2353
405	132.5	0.60362	1.2364
406	133.2	0.60411	1.2362
407	133.9	0.60335	1.2364
408	134.6	0.60417	1.2363
409	135.3	0.60473	1.2369
410	136	0.604	1.236
411	136.8	0.6033	1.2363
412	137.5	0.60357	1.2362
413	138.2	0.60391	1.2364
414	138.9	0.60598	1.2366
415	139.7	0.60293	1.2361
416	140.4	0.60087	1.2355
417	141.1	0.60643	1.2369
418	141.9	0.60415	1.2365
419	142.6	0.60246	1.2362

420	143.4	0.60734	1.2369
421	144.1	0.60192	1.2361
422	144.9	0.60242	1.2361
423	145.6	0.60411	1.2364
424	146.4	0.60481	1.2364
425	147.1	0.60342	1.2359
426	147.9	0.60082	1.2355
427	148.7	0.6054	1.2364
428	149.5	0.60207	1.2364
429	150.2	0.60576	1.2368
430	151	0.60449	1.2367
431	151.8	0.60204	1.2357
432	152.6	0.60188	1.2358
433	153.4	0.6063	1.2369
434	154.2	0.60518	1.2361
435	155	0.60434	1.2365
436	155.8	0.60445	1.2366
437	156.6	0.60239	1.2357
438	157.4	0.60329	1.2361
439	158.2	0.60349	1.2363
440	159.1	0.60392	1.2364
441	159.9	0.60196	1.2362
442	160.7	0.605	1.2364
443	161.5	0.60163	1.2357
444	162.4	0.60259	1.236
445	163.2	0.60448	1.2365
446	161.1	0.606	1.2367
447	164.9	0.6022	1.2364
448	165.8	0.60387	1.2362
449	166.6	0.60519	1.2364
450	167.5	0.60476	1.2362
451	168.3	0.60225	1.236
452	169.2	0.60503	1.2362
453	170.1	0.60452	1.2366
454	170.9	0.60321	1.2362
455	171.8	0.60424	1.2366
456	172.7	0.60135	1.2354
457	173.6	0.60246	1.2358
458	174.5	0.60588	1.2366
459	175.4	0.60163	1.2357
460	176.3	0.60368	1.2365
461	177.2	0.60353	1.2362
462	178.1	0.60339	1.2359
463	179	0.60255	1.2363

464	179.9	0.60374	1.2366
465	180.8	0.60368	1.2363
466	181.8	0.60346	1.2365
467	182.7	0.60303	1.2359
468	183.6	0.60494	1.2365
469	184.6	0.60249	1.236
470	185.5	0.60256	1.2361
471	186.5	0.6047	1.2366
472	187.4	0.60426	1.2366
473	188.4	0.60368	1.2364
474	189.3	0.60389	1.2362
475	190.3	0.60406	1.236
476	191.3	0.60502	1.2365
477	192.2	0.60314	1.236
478	193.2	0.60335	1.2362
479	194.2	0.60331	1.2357
480	195.2	0.60263	1.2358
481	196.2	0.60305	1.2359
482	197.2	0.60411	1.2368
483	198.2	0.60361	1.236
484	199.2	0.60171	1.2359
485	200.2	0.60411	1.2364
486	201.2	0.60268	1.2358
487	202.2	0.60248	1.2362
488	203.3	0.60386	1.2363
489	204.3	0.60303	1.2363
490	205.3	0.60512	1.2368
491	206.4	0.60417	1.2367
492	207.4	0.60234	1.2361
493	208.5	0.60232	1.236
494	209.5	0.60361	1.2364
495	210.6	0.60489	1.2369
496	211.6	0.60401	1.2364
497	212.7	0.60356	1.2361
498	213.8	0.60319	1.236
499	214.9	0.60246	1.236
500	216	0.6063	1.2372
501	217	0.60365	1.236
502	218.1	0.60332	1.2365
503	219.2	0.60309	1.2362
504	220.3	0.60408	1.2362
505	221.5	0.60144	1.2358
506	222.6	0.60271	1.2361
507	223.7	0.60466	1.2365

508	224.8	0.601-1	1.2357
509	226	0.60249	1.2356
510	227.1	0.6022	1.236
511	228.2	0.60263	1.2361
512	229.4	0.60436	1.2362
513	230.5	0.60138	1.2358
514	231.7	0.60298	1.2364
515	232.9	0.60409	1.2362
516	234	0.60378	1.2362
517	235.2	0.60474	1.2363
518	236.4	0.60387	1.2361
519	237.6	0.60427	1.2363
520	238.8	0.60322	1.2364
521	240	0.602	1.2359
522	241.2	0.60424	1.2362
523	242.4	0.60227	1.236
524	243.6	0.60418	1.2364
525	244.8	0.60269	1.2361
526	246.1	0.60462	1.2364
527	247.3	0.60401	1.2363
528	248.5	0.60141	1.2355
529	249.8	0.60385	1.2363
530	251	0.60271	1.2365
531	252.3	0.60357	1.2362
532	253.5	0.60308	1.2362
533	254.8	0.60286	1.2361
534	256.1	0.6048	1.2365
535	257.4	0.60582	1.2368
536	258.7	0.6038	1.2362
537	260	0.60258	1.236
538	261.3	0.60285	1.236
539	262.6	0.60231	1.2358
540	263.9	0.60326	1.2364
541	265.2	0.60329	1.2361
542	266.5	0.60258	1.2362
543	267.8	0.6046	1.2361
544	269.2	0.60378	1.2364
545	270.5	0.60281	1.2361
546	271.9	0.60413	1.2362
547	273.2	0.60194	1.2358
548	274.6	0.60324	1.2363
549	276	0.60345	1.2361
550	277.3	0.60294	1.2359
551	278.7	0.60275	1.2364

552	280.1	0.60376	1.236
553	281.5	0.60302	1.2361
554	282.9	0.60241	1.2361
555	284.3	0.60264	1.236
556	285.7	0.60501	1.2363
557	287.2	0.60473	1.236
558	288.6	0.60415	1.2364
559	290	0.60225	1.2359
560	291.5	0.60295	1.2362
561	292.9	0.60347	1.2363
562	294.4	0.60347	1.2363
563	295.8	0.6017	1.2362
564	297.3	0.60335	1.2361
565	298.8	0.60289	1.236
566	300.3	0.60365	1.2363
567	301.8	0.60244	1.2358
568	303.3	0.60309	1.2366
569	304.8	0.6025	1.2359
570	306.3	0.6033	1.2363
571	307.8	0.60189	1.2355
572	309.3	0.60106	1.2359
573	310.9	0.60309	1.236
574	312.4	0.60378	1.2361
575	314	0.60341	1.2358
576	315.5	0.60254	1.2359
577	317.1	0.60279	1.2361
578	318.7	0.60293	1.2358
579	320.3	0.60242	1.2359
580	321.8	0.60239	1.2358
581	323.4	0.6029	1.2358
582	325	0.60203	1.2359
583	326.7	0.60346	1.236
584	328.3	0.60273	1.2358
585	329.9	0.60234	1.2359
586	331.5	0.60481	1.2367
587	333.2	0.60309	1.2362
588	334.8	0.60143	1.2359
589	336.5	0.60276	1.2361
590	338.2	0.60111	1.2357
591	339.9	0.60536	1.2368
592	341.5	0.60237	1.236
593	343.2	0.60287	1.2359
594	344.9	0.60391	1.2364
595	346.6	0.60093	1.2356

596	348.3	0.60564	1.2367
597	350.1	0.60257	1.2359
598	351.8	0.60378	1.2361
599	353.5	0.60189	1.236
600	355.3	0.60238	1.2359
601	357	0.60219	1.2363
602	358.8	0.60171	1.2359
603	360.6	0.60152	1.2359
604	362.3	0.60215	1.236
605	364.1	0.60366	1.2364
606	365.9	0.60322	1.2365
607	367.8	0.60243	1.2362
608	369.6	0.60324	1.2363
609	371.4	0.60417	1.2368
610	373.2	0.60469	1.2368
611	375.1	0.60346	1.2364
612	376.9	0.60326	1.2361
613	378.8	0.60269	1.2361
614	380.7	0.60412	1.2362
615	382.6	0.60286	1.2361
616	384.4	0.6032	1.2364
617	386.3	0.60391	1.236
618	388.2	0.60197	1.2361
619	390.2	0.60253	1.2361
620	392.1	0.60401	1.236
621	394	0.60399	1.2361
622	396	0.60258	1.2358
623	397.9	0.60224	1.2359
624	399.9	0.60291	1.2361
625	401.9	0.60275	1.2358
626	403.8	0.60288	1.2362
627	405.8	0.60405	1.2362
628	407.8	0.60158	1.2357
629	409.9	0.60205	1.2361
630	411.9	0.60178	1.2361
631	413.9	0.60168	1.2359
632	416	0.60287	1.2362
633	418	0.60187	1.236
634	420.1	0.60538	1.2365
635	422.1	0.60275	1.2361
636	424.2	0.6007	1.2356
637	426.3	0.60394	1.2362
638	428.4	0.60147	1.2358
639	430.5	0.60237	1.2363

640	432.7	0.60304	1.2362
641	434.8	0.60313	1.236
642	436.9	0.60343	1.2364
643	439.1	0.60474	1.2367
644	441.3	0.60375	1.2359
645	443.4	0.60408	1.2359
646	445.6	0.60169	1.2361
647	447.8	0.60481	1.2365
648	450	0.60323	1.2359
649	452.2	0.6009	1.2355
650	454.5	0.60313	1.2364
651	456.7	0.60355	1.2359
652	458.9	0.60174	1.2357
653	461.2	0.60503	1.2366
654	463.5	0.60304	1.2362
655	465.8	0.60177	1.2361
656	468.1	0.60277	1.2358
657	470.4	0.60473	1.2363
658	472.7	0.60108	1.2358
659	475	0.60317	1.2361
660	477.3	0.60287	1.2359
661	479.7	0.60413	1.2359
662	482.1	0.60337	1.2358
663	484.4	0.60297	1.236
664	486.8	0.6057	1.2369
665	489.2	0.6028	1.2358
666	491.6	0.60247	1.2356
667	494	0.60244	1.2361
668	496.5	0.60492	1.2366
669	498.9	0.60393	1.2362
670	501.4	0.60404	1.2362
671	503.8	0.60227	1.2358
672	506.3	0.60225	1.2363
673	508.8	0.6041	1.2361
674	511.3	0.60241	1.2358
675	513.8	0.60161	1.2356
676	516.4	0.60175	1.2358
677	518.9	0.60279	1.2358
678	521.5	0.60215	1.2356
679	524	0.60373	1.2359
680	526.6	0.6038	1.2361
681	529.2	0.60434	1.2364
682	531.8	0.60303	1.2358
683	534.4	0.60477	1.2361

684	537	0.60404	1.2361
685	539.7	0.603	1.2361
686	542.3	0.60245	1.2358
687	545	0.60254	1.236
688	547.7	0.60249	1.236
689	550.4	0.60334	1.2362
690	553.1	0.60296	1.236
691	555.8	0.60399	1.2364
692	558.5	0.60338	1.236
693	561.3	0.6036	1.2361
694	564	0.60336	1.2362
695	566.8	0.60372	1.2361
696	569.6	0.60286	1.2358
697	572.4	0.60193	1.2357
698	575.2	0.60169	1.2359
699	578	0.60202	1.2357
700	580.9	0.6028	1.236
701	583.7	0.60193	1.2359
702	586.6	0.6026	1.2359
703	589.5	0.60298	1.2359
704	592.4	0.60148	1.2356
705	595.3	0.60429	1.2362
706	598.2	0.60259	1.2358
707	601.2	0.60364	1.2362
708	604.1	0.60189	1.2359
709	607.1	0.60315	1.2362
710	610.1	0.60376	1.2363
711	613.1	0.60235	1.2357
712	616.1	0.60413	1.2362
713	619.1	0.6027	1.236
714	622.2	0.60325	1.236
715	625.3	0.60253	1.2358
716	628.3	0.60416	1.2363
717	631.4	0.60301	1.2359
718	634.5	0.60265	1.2361
719	637.6	0.60386	1.2361
720	640.8	0.60382	1.2361
721	643.9	0.60353	1.2361
722	647.1	0.60227	1.236
723	650.3	0.60272	1.2361
724	653.5	0.60318	1.2359
725	656.7	0.60247	1.2358
726	659.9	0.60338	1.2361
727	663.2	0.60368	1.2362

728	666.4	0.60309	1.2362
729	669.7	0.60328	1.2359
730	673	0.60241	1.2357
731	676.3	0.60312	1.2359
732	679.6	0.60331	1.236
733	683	0.60292	1.2362
734	686.3	0.603	1.2359
735	689.7	0.60251	1.236
736	693.1	0.60323	1.2361
737	696.5	0.60273	1.2359
738	699.9	0.60151	1.2357
739	703.3	0.60328	1.2361
740	706.8	0.60378	1.2361
741	710.2	0.60211	1.2358
742	713.7	0.60351	1.2359
743	717.3	0.60324	1.2361
744	720.8	0.60333	1.236
745	724.3	0.60318	1.236
746	727.9	0.60296	1.236
747	731.5	0.60241	1.2361
748	735.1	0.60279	1.2361
749	738.7	0.60267	1.236
750	742.3	0.60279	1.236
751	746	0.60266	1.2358
752	749.7	0.60306	1.2358
753	753.3	0.60242	1.2357
754	757	0.60229	1.2358
755	760.8	0.60272	1.2359
756	764.5	0.6033	1.2362
757	768.3	0.60309	1.236
758	772	0.60275	1.2359
759	775.8	0.60255	1.2359
760	779.7	0.60315	1.236
761	783.5	0.60176	1.2359
762	787.3	0.60219	1.2359
763	791.2	0.60316	1.2361
764	795.1	0.60312	1.2362
765	799	0.60351	1.236
766	802.9	0.60217	1.2356
767	806.9	0.6027	1.2362
768	810.9	0.60267	1.2358
769	814.8	0.60288	1.2361
770	818.8	0.60235	1.2361
771	822.9	0.6024	1.2361

772	826.9	0.60194	1.236
773	831	0.60183	1.236
774	835.1	0.6021	1.2362
775	839.2	0.60276	1.2362
776	843.3	0.60211	1.2363
777	847.4	0.60229	1.2363
778	851.6	0.60223	1.2361
779	855.8	0.60241	1.2362
780	860	0.60259	1.2361
781	864.2	0.60297	1.2361
782	868.5	0.60275	1.236
783	872.8	0.60222	1.2362
784	877.1	0.60217	1.2362
785	881.4	0.60243	1.2361
786	885.7	0.60201	1.236

GEYSERS SHALLOW RESERVOIR
UNKNOWN WELL - SIZE No. 10 TO 150 MESH

	Bottom	Top
The steam charge (volts):	0.7258	0.7087
The steam charge (bars):	1.51268	1.6113
The steam charge (P/Pz):	0.817526	0.798265
The calibration (volts):	0.9697	0.8889
The pressure of the atmosphere (volts):	0.47949	0.46912
The pressure of the atmosphere (bars):	0.999329	1.06659
The vacuum reading (volts) after the run:	-1.39E-03	2.36E-02
The saturated vapor–pressure of water (volts):	0.8878	
The saturated vapor pressure of water (bars):	2.0185	
The temperature-(degrees kelvin) is:	393.684	
The calibration pressure (bars):	2.021	
The geometric progression factor:	1005	
The # of samples per displayed point:	40	
The diameter of the sample (cm)	2.362	
The length of the sample (cm)	31.27	
The weight of the sample (gm)	217.121	
The permeability of the sample (darcys)	27	

	Time(sec)	Bottom(bars)	Top(bars)
1	4.29E-02	1.0066	1.5586
2	0.1139	1.0117	1.5229
3	0.1849	1.0065	1.4359
4	0.256	1.0028	1.3407
5	0.3274	1.0009	1.2652
6	0.3986	1.0009	1.2128
7	0.4699	1.0014	1.1774
8	0.541	1.0018	1.1523
9	0.6122	1.0029	1.1342
10	0.6832	1.0011	1.1201
11	0.7542	1.0011	1.1096
12	0.8253	1.001	1.1022
13	0.8964	1.0019	1.0964
14	0.9674	0.99937	1.0914
15	1.038	1.0014	1.0882
16	1.11	1.0021	1.0857
17	1.181	1.0016	1.0834
18	1.253	1.0014	1.0813
19	1.324	1.0014	1.0802
20	1.396	1.0009	1.0787
21	1.467	1.0018	1.0782
22	1.539	1.0026	1.0772

23	1.61	1.0023	1.0762
24	1.682	1.0026	1.0759
25	1.753	1.0001	1.0748
26	1.825	1.0013	1.0744
27	1.896	1.0031	1.0745
28	1.968	1.0018	1.0737
29	2.039	1.0012	1.0731
30	2.111	1.0014	1.0728
31	2.182	1.0009	1.0726
32	2.254	1.0008	1.0723
33	2.325	1.0004	1.072
34	2.494	1.0015	1.0716
35	2.66	1.0008	1.0711
36	2.827	1.0023	1.0708
37	2.994	1.0011	1.0706
38	3.16	1.0014	1.0702
39	3.327	1.0016	1.0701
40	3.494	1.0003	1.0696
41	3.66	1.0017	1.0698
42	3.827	1.0011	1.0696
43	3.994	1.0003	1.0691
44	4.16	1.002	1.0694
45	4.327	1.0018	1.0694
46	4.494	1.0009	1.0689
47	4.66	1.0009	1.0692
48	4.827	1.0015	1.069
49	4.991	1.0006	1.0687
50	5.16	1.0011	1.0689
51	5.327	1.0011	1.0685
52	5.494	1.0002	1.0685
53	5.66	1.0022	1.0689
54	5.827	1.0017	1.0689
55	5.994	1.0019	1.0687
56	6.16	1.0016	1.0685
57	6.327	1.0015	1.0685
58	6.494	1.0018	1.0685
59	6.66	1.002	1.0685
60	6.827	1.0013	1.0683
61	6.991	1.0016	1.0685
62	7.16	1.0012	1.0682
63	7.327	1.0015	1.0682
64	7.51	1.0024	1.0683
65	7.693	1.0027	1.0687
66	7.877	1.0004	1.068

67	8.06	1.001	1.0681
68	8.244	1.0002	1.0679
69	8.427	1.0024	1.0682
70	8.61	1.0018	1.0681
71	8.794	1.0004	1.0679
72	8.977	1.0017	1.0682
73	9.161	1.0001	1.0677
74	9.344	1.0018	1.0683
75	9.527	1.0012	1.0679
76	9.711	1.0012	1.068
77	9.894	1.0011	1.068
78	10.08	1.0021	1.0678
79	10.26	1.0022	1.0683
80	10.44	1.0009	1.0678
81	10.63	1.0012	1.0679
82	10.81	1.0021	1.0682
83	10.99	1.0043	1.0683
84	11.18	1.0022	1.0678
85	11.36	1.001	1.0677
86	11.54	1.0018	1.0681
87	11.73	1.0007	1.0675
88	11.91	1.0011	1.0678
89	12.09	1.0016	1.0678
90	12.28	1.0022	1.0681
91	12.48	1.0015	1.068
92	12.68	1.0005	1.0676
93	12.88	1.0019	1.0676
94	13.08	1.0008	1.0677
95	13.28	1.0006	1.0676
96	13.48	1.0019	1.068
97	13.68	1.0015	1.0677
98	13.88	1.0021	1.0678
99	14.08	1.0015	1.0677
100	14.28	1.000	1.0673
101	14.48	1.0006	1.0675
102	14.68	1.0025	1.0678
103	14.88	1.0006	1.0675
104	15.08	1.003	1.0677
105	15.28	1.001	1.0674
106	15.48	0.99973	1.0672
107	15.68	1.0023	1.0678
108	15.88	1.0007	1.0675
109	16.08	1.0019	1.0677
110	16.28	1.0007	1.0675

111	16.48	1.0037	1.0682
112	16.68	1.0017	1.0676
113	16.88	1.0027	1.0679
114	17.08	1.0026	1.0677
115	17.29	1.0025	1.0676
116	17.51	1.0011	1.0674
117	17.73	1.0011	1.0674
118	17.94	1.0023	1.0675
119	18.16	1.0016	1.0674
120	18.38	1.0023	1.0676
121	18.59	1.0028	1.0679
122	18.81	0.99928	1.0673
123	19.03	1.001	1.0676
124	19.24	1.0006	1.0675
125	19.46	0.99934	1.0672
126	19.68	1.0019	1.0681
127	19.89	1.0036	1.068
128	20.11	1.0026	1.0677
129	20.33	1.0018	1.068
130	20.54	1.0027	1.0678
131	20.76	1.0008	1.0673
132	20.98	1.0016	1.0677
133	21.19	1.0029	1.0681
134	21.41	1.0023	1.0677
135	21.63	1.0015	1.0675
136	21.86	1.0027	1.0679
137	22.09	1.0019	1.0675
138	22.33	1.0009	1.0674
139	22.56	1.0007	1.0674
140	22.79	1.0023	1.0678
141	23.03	1.0003	1.0672
142	23.26	1.0008	1.0673
143	23.49	1.0031	1.0679
144	23.73	1.0028	1.0678
145	23.96	1.0014	1.0675
146	24.19	1.0032	1.0676
147	24.43	1.0024	1.0676
148	24.66	1.0026	1.0681
149	24.89	0.99969	1.0671
150	25.13	1.0009	1.0674
151	25.36	1.0027	1.0679
152	25.59	1.0019	1.0676
153	25.83	1.0007	1.0674
154	26.06	1.0015	1.0674

155	26.31	1.0021	1.0673
156	26.56	1.0017	1.0676
157	26.81	1.0032	1.0679
158	27.06	1.0036	1.068
159	27.31	1.001	1.0674
160	27.56	1.0018	1.0674
161	27.81	1.0011	1.0672
162	28.06	0.99979	1.0671
163	28.31	1.0022	1.0674
164	28.56	1.0028	1.0677
165	28.81	1.0008	1.0673
166	29.06	1.0011	1.0673
167	29.31	1.0005	1.0674
168	29.56	1.0022	1.0677
169	29.81	1.0012	1.0673
170	30.06	1.002	1.0676
171	30.31	1.002	1.0675
172	30.58	1.0009	1.0674
173	30.85	1.0021	1.0677
174	31.11	1.0019	1.0675
175	31.38	1.002	1.0675
176	31.65	1.0014	1.0672
177	31.91	1.0016	1.0674
178	32.18	1.0016	1.0674
179	32.45	1.0029	1.0677
180	32.71	1.0031	1.0676
181	32.98	1.0012	1.0675
182	33.25	1.0022	1.0674
183	33.51	0.99894	1.0668
184	33.78	1.0018	1.0675
185	34.05	1.0007	1.0672
186	34.31	1.0022	1.0677
187	34.58	1.0009	1.0672
188	34.85	1.0021	1.0675
189	35.13	1.001	1.0671
190	35.41	1.0011	1.0675
191	35.7	1.0019	1.0672
192	35.98	1.0016	1.0674
193	36.26	1.0014	1.0673
194	36.55	1.0021	1.0679
195	36.83	1.0031	1.0679
196	37.11	1.0027	1.0678
197	37.4	1.0017	1.0675
198	37.68	1.0009	1.0672

199	37.96	1.0002	1.0673
200	38.25	0.99997	1.067
201	38.53	1.0021	1.0672
202	38.81	1.0015	1.0676
203	39.11	1.0022	1.0676
204	39.41	1.0027	1.0678
205	39.71	1.0019	1.0676
206	40.01	1.0013	1.0673
207	40.31	0.99922	1.0671
208	40.61	1.0019	1.0678
209	40.91	1.0017	1.0674
210	41.21	1.0027	1.0676
211	41.51	1.002	1.0676
212	41.81	1.0002	1.0671
213	42.11	1.0015	1.0674
214	42.41	1.0016	1.0674
215	42.71	1.0019	1.0676
216	43.01	1.0016	1.0674
217	43.33	1.0017	1.0672
218	43.65	1.0016	1.0673
219	43.96	0.99996	1.0669
220	44.28	1.0022	1.0674
221	44.6	1.0019	1.0675
222	44.91	1.0034	1.0678
223	45.23	1.0018	1.0674
224	45.55	1.0012	1.0674
225	45.86	1.0035	1.0678
226	46.18	1.0022	1.0675
227	46.5	1.0011	1.0669
228	46.81	1.0022	1.0674
229	47.13	1.0026	1.0675
230	47.46	1.0017	1.0673
231	47.8	1.0023	1.0674
232	48.13	1.0017	1.0675
233	48.46	3.0024	1.0676
234	48.8	1.0022	1.0676
235	49.13	1.001	1.0671
236	49.46	1.002	1.0673
237	49.8	1.001	1.0673
238	50.13	1.0009	1.0671
239	50.46	0.99964	1.0668
240	50.8	1.0019	1.0674
241	51.13	1.0018	1.0672
242	51.48	1.0007	1.0674

243	51.83	1.0009	1.067
244	52.18	1.0011	1.0671
245	52.53	1.0033	1.0676
246	52.88	1.0023	1.0672
247	53.23	1.0007	1.067
248	53.58	1.0025	1.0676
249	53.93	1.0002	1.067
250	54.28	1.0019	1.0673
251	54.63	1.0018	1.0674
252	54.98	1.0012	1.0673
253	55.33	1.0017	1.0673
254	55.7	1.0004	1.0672
255	56.06	1.0021	1.0673
256	56.43	1.0021	1.0671
257	56.8	1.0018	1.0675
258	57.16	1.0002	1.0671
259	57.53	1.0021	1.0674
260	57.9	1.0021	1.0674
261	58.26	1.0019	1.0674
262	58.63	1.0022	1.0672
263	59	1.003	1.0677
264	59.36	1.0017	1.0675
265	59.75	1.0008	1.0671
266	60.13	1.0023	1.0675
267	60.51	1.0014	1.067
268	60.9	1.0027	1.0675
269	61.28	1.0012	1.0671
270	61.66	1	1.067
271	62.05	1.0024	1.0674
272	62.43	1.0025	1.0674
273	62.81	1.0013	1.0671
274	63.2	1.0023	1.0675
275	63.6	1.0013	1.0673
276	64	1.001	1.067
277	64.4	1.0023	1.0675
278	64.8	1.0011	1.0672
279	65.2	1.0032	1.0676
280	65.6	1.0004	1.0669
281	66	1.0034	1.0677
282	66.4	1.0027	1.0672
283	66.8	1.0036	1.0679
284	67.2	1.0009	1.067
285	67.62	1.0031	1.0678
286	68.03	1.0001	1.0672

287	68.45	1.001	1.0673
288	68.87	1.0005	1.067
289	69.28	0.99927	1.0668
290	69.7	1.0024	1.0673
291	70.12	1.0018	1.0674
292	70.53	1.0019	1.0674
293	70.95	1.0026	1.0674
294	71.38	1.0016	1.0674
295	71.82	1.0021	1.0673
296	72.25	1.0005	1.0673
297	72.68	1.0012	1.0673
298	73.12	1.0005	1.0671
299	73.55	1.0021	1.0675
300	73.98	1.0017	1.0675
301	74.42	1.0008	1.0673
302	74.85	1.0026	1.0677
303	75.3	1.0003	1.0672
304	75.75	1.0004	1.067
305	76.2	1.0014	1.0673
306	76.65	1.002	1.0674
307	77.1	1.0015	1.0672
308	77.55	1.0018	1.0674
309	78	3.0023	1.0675
310	78.45	1.0023	1.0675
311	78.92	1.0026	1.0674
312	79.38	1.0024	1.0675
313	79.85	1.0013	1.067
314	80.32	1.0009	1.0671
315	80.78	1.0017	1.0674
316	81.25	1.002	1.0673
317	81.72	1.0015	1.0674
318	82.18	1.0012	1.0676
319	82.65	0.99983	1.0671
320	83.13	1.0021	1.0676
321	83.62	1.0006	1.0671
322	84.1	1.0018	1.0674
323	84.58	1.0011	1.0671
324	85.07	1.0029	1.0678
325	85.55	1.0014	1.067
326	86.03	1.001	1.067
327	86.53	1.0019	1.0675
328	87.03	1.0021	1.0675
329	87.53	1.0015	1.0674
330	88.03	1.0015	1.0674

331	88.53	1.0004	1.067
332	89.03	1.0005	1.0673
333	89.53	1.0008	1.0672
334	90.03	1.0029	1.0676
335	90.55	1.0009	1.0672
336	91.07	1.001	1.0671
337	91.58	1.0016	1.0675
338	92.1	1.001	1.0672
339	92.62	1.0001	1.0669
340	93.13	1.0026	1.0675
341	93.65	1.0018	1.0674
342	94.18	1.0009	1.0673
343	94.72	1.0012	1.0673
344	95.25	1.0003	1.0669
345	95.78	1.0012	1.0672
346	96.32	1.0012	1.0672
347	96.85	1.002	1.0674
348	97.38	1.0028	1.0678
349	97.93	1.0032	1.0676
350	98.48	1.0008	1.0674
351	99.03	1.0022	1.0675
352	99.58	1.0015	1.0673
353	100.1	1.0001	1.0671
354	100.7	1.0016	1.0673
355	101.2	1.0025	1.0673
356	101.8	1.0021	1.0675
357	102.4	1.0013	1.0673
358	102.9	1.002	1.0676
359	103.5	1.0009	1.0672
360	104.1	0.99983	1.067
361	104.6	1.0013	1.067
362	105.2	1.0019	1.0673
363	105.8	1.0014	1.0673
364	106.4	1.0025	1.0672
365	107	1.002	1.0673
366	107.5	1.0024	1.0675
367	108.1	1.0025	1.0674
368	108.7	1.0031	1.0675
369	109.3	1.0017	1.0673
370	109.9	1.0025	1.0676
371	110.5	1.0002	1.0671
372	111.1	1.0008	1.0672
373	111.7	1.001	1.0672
374	112.3	1.0038	1.0676

375	112.9	1.0021	1.0674
376	113.5	1.0013	1.0672
377	114.2	1.001	1.067
378	114.8	1.0011	1.0666
379	115.4	1.0025	1.0674
380	116	1.0003	1.0668
381	116.6	0.99941	1.0668
382	117.3	1.0011	1.0671
383	117.9	1.0013	1.0671
384	118.5	1.0026	1.0673
385	119.2	1.0031	1.0673
386	119.8	1.0015	1.0673
387	120.5	1.0001	1.067
388	121.1	1.0013	1.0672
389	121.8	1.0016	1.0674
390	122.4	1.0031	1.0674
391	123.1	1.0021	1.0676
392	123.7	1.001	1.0672
393	124.4	1.0022	1.0672
394	125	1.002	1.0675
395	125.7	1.0003	1.0669
396	126.4	1.0018	1.067
397	127	1.0015	1.0673
398	127.7	1.0029	1.0674
399	128.4	1.0019	1.0676
400	129.1	1.0035	1.0674
401	129.8	1.0008	1.067
402	130.4	1.0018	1.0672
403	131.1	1.0018	1.0671
404	131.8	1.0021	1.0674
405	132.5	1.0019	1.0673
406	133.2	1.0011	1.0671
407	133.9	1.0012	1.0673
408	134.6	1.0016	1.0672
409	135.3	1.0004	1.0669
410	136.1	1.0032	1.0675
411	136.8	1.0019	1.0674
412	137.5	1.001	1.0671
413	138.2	1.0007	1.0669
414	138.9	1.0033	1.0672
415	139.7	1.0018	1.0674
416	140.4	1.001	1.067
417	141.1	1.0015	1.067
418	141.9	1.0029	1.0675

419	142.6	1.0016	1.0671
420	143.4	1.0015	1.0673
421	144.1	1.0029	1.0676
422	144.9	1.0023	1.0675
423	145.6	1.001	1.0672
424	146.4	1.0007	1.0668
425	147.2	1.0004	1.0669
426	147.9	0.99968	1.0668
427	148.7	1.0013	1.0672
428	149.5	1.0003	1.067
429	150.3	1.001	1.0672
430	151	0.99933	1.0666
431	151.8	1.0013	1.0672
432	152.6	1.0012	1.0671
433	153.4	1.0014	1.0671
434	154.2	1.0013	1.0671
435	155	1.003	1.0678
436	155.8	1.002	1.0674
437	156.6	1.001	1.0673
438	157.4	1.0007	1.0673
439	158.3	1.0019	1.0673
440	159.1	1.0017	1.0673
441	159.9	1.0034	1.0679
442	160.7	1.0002	1.0668
443	161.6	1.0014	1.0672
444	162.4	1.0001	1.0669
445	163.2	1.0001	1.067
446	164.1	0.99976	1.0669
447	164.9	1.0015	1.067
448	165.8	1.0004	1.0668
449	166.6	1.001	1.0671
450	167.5	1.0028	1.0675
451	168.4	1.0016	1.0673
452	169.2	1.0028	1.0673
453	170.1	1.0002	1.0668
454	171	1.0005	1.0671
455	171.8	1.0028	1.0673
456	172.7	1.0013	1.0667
457	173.6	0.99949	1.0666
458	174.5	1.0019	1.067
459	175.4	1.0031	1.068
460	176.3	1.0009	1.067
461	177.2	1.0006	1.0675
462	178.1	1.0023	1.0675

463	179	1.0003	1.0672
464	179.9	1.0016	1.0673
465	180.8	0.99998	1.067
466	181.8	1.0013	1.0669
467	182.7	1.0001	1.0667
468	183.6	1.0013	1.0673
469	184.6	0.99989	1.0669
470	185.5	1.0029	1.0676
471	186.5	0.99838	1.0665
472	187.4	1.0014	1.0672
473	188.4	1.0005	1.0666
474	189.3	0.9999	1.0665
475	190.3	1.003	1.0675
476	191.3	1.001	1.0673
477	192.2	1.0033	1.0674
478	193.2	0.99886	1.0664
479	194.2	0.99949	1.0666
480	195.2	1.0001	1.0669
481	196.2	0.99975	1.0668
482	197.2	1.0016	1.0671
483	198.2	1.0015	1.0675
484	199.2	1.0004	1.0669
485	200.2	1.0017	1.067
486	201.2	1.0005	1.0671
487	202.2	1.0031	1.0673
488	203.3	1.0006	1.067
489	204.3	1.0024	1.0675
490	205.3	0.99829	1.0666
491	206.4	0.99963	1.0669
492	207.4	0.99888	1.0665
493	208.5	1.004	1.068
494	209.5	0.99737	1.0662
495	210.6	1.0003	1.0671
496	211.7	0.99987	1.067
497	212.7	0.9986	1.0666
498	213.8	0.99956	1.0669
499	214.9	1.0023	1.0675
500	216	1.0044	1.0677
501	217.1	0.99969	1.0669
502	218.2	0.99981	1.0669
503	219.3	1.0007	1.0669
504	220.4	1.0039	1.0677
505	221.5	1.0048	1.0677
506	222.6	1.0014	1.0668

507	223.7	1.0004	1.0672
508	224.8	0.99827	1.0661
509	226	1.0021	1.0675
510	227.1	1	1.0661
511	228.3	0.99819	1.0664
512	229.4	0.99956	1.0665
513	230.6	0.9998	1.0666
514	231.7	0.99861	1.0668
515	232.9	1.0004	1.0665
516	234.1	0.9979	1.0662
517	235.2	1.0057	1.0679
518	236.4	1.003	1.0676
519	237.6	1.0009	1.0668
520	238.8	0.99934	1.0665
521	240	0.99911	1.0661
522	241.2	1.0001	1.0666
523	242.4	1.0026	1.0672
524	243.6	0.99989	1.0669
525	244.9	0.99896	1.0667
526	246.1	1.0039	1.0672
527	247.3	1.0008	1.0669
528	248.6	1.002	1.0674
529	249.8	1.0031	1.0675
530	251.1	1.0028	1.0673
531	252.3	0.99993	1.0667
532	253.6	1.0014	1.0668
533	254.8	1.0038	1.0673
534	256.1	1.0027	1.0674
535	257.4	0.99933	1.0661
536	258.7	1.0026	1.067
537	260	1.0001	1.0663
538	261.3	0.99614	1.0654
539	262.6	1.0029	1.0672
540	263.9	1	1.0666
541	265.2	0.99682	1.0659
542	266.5	1.002	1.0668
543	267.9	0.99745	1.066
544	269.2	1.0024	1.0668
545	270.6	1.0019	1.067
546	271.9	1.0025	1.0672
547	273.3	1.0013	1.067
548	274.6	1.0037	1.0676
549	276	1.0021	1.0678
550	277.4	3.0037	1.0677

551	278.8	1.0027	1.0673
552	280.1	0.99835	1.066
553	281.5	0.99667	1.0657
554	282.9	0.99953	1.0668
555	284.4	1.0005	1.0669
556	285.8	1.0004	1.0669
557	287.2	1.0013	1.067
558	288.6	0.99805	1.0663
559	290.1	1.0033	1.0672
560	291.5	1.0018	1.0668
561	293	1.002	1.0674
562	294.4	1.0015	1.0672

GEYSERS SHALLOW RESERVOIR
UNKNOWN WELL SIZE 30 - 150 MESH

	Bottom	Top
The steam charge (volts):	0.6855	0.67
The steam charge (bars):	1.44766	1.54256
The steam charge (P/Pz):	0.77222	0.754759
The calibration (volts):	0.9693	0.8891
The pressure of the atmosphere (volts):	0.47831	0.46875
The pressure of the atmosphere (bars):	1.01011	1.07922
The vacuum reading (volts) after the run	-6.01E-03	2.42E-02
The saturated vapor-pressure of water (volts):	0.8877	
The saturated vapor pressure of water (bars):	2.04378	
The temperature (degrees kelvin) is:	394.078	
The calibration pressure (bars):	2.047	
The geometric progression factor:	1005	
The # of samples per displayed point:	40	
The diameter of the sample (cm)	1.727	
The length of the sample (cm)	30.63	
The weight of the sample (gm)	106.78	
The permeability of the sample (darcys)	21.3	

	Time(sec)	Bottom(bars)	Top(bars)
1	4.29E-02	1.0152	1.4684
2	0.1143	1.0158	1.4572
3	0.1859	1.0133	1.4263
4	0.2573	1.0123	1.3861
5	0.3288	1.0114	1.3478
6	0.4003	1.0117	1.3153
7	0.4718	1.0121	1.2883
8	0.5433	1.012	1.2652
9	0.6147	1.0126	1.2452
10	0.6864	1.0124	1.2274
11	0.7577	1.0126	1.2122
12	0.8292	1.0125	1.1987
13	0.9007	1.0123	1.1869
14	0.9722	1.0118	1.1759
15	1.044	1.0123	1.1664
16	1.115	1.0125	1.1579
17	1.187	1.0122	1.1504
18	1.258	1.0122	1.1437
19	1.33	1.0123	1.1377
20	1.401	1.0121	1.1323
21	1.473	1.012	1.1274
22	1.544	1.0121	1.123

23	1.615	1.0126	1.1191
24	1.687	1.0125	1.1153
25	1.758	1.0125	1.1122
26	1.83	1.012	1.1092
27	1.901	1.0123	1.1069
28	1.973	1.0117	1.1045
29	2.044	1.0121	1.1024
30	2.116	1.0123	1.1004
31	2.187	1.0113	1.0986
32	2.259	1.0122	1.097
33	2.33	1.0122	1.0957
34	2.486	1.0117	1.0931
35	2.653	1.0125	1.0909
36	2.819	1.0123	1.089
37	2.986	1.012	1.0874
38	3.153	1.0119	1.086
39	3.319	1.0121	1.085
40	3.486	1.0117	1.0843
41	3.653	1.0117	1.0837
42	3.819	1.0124	1.083
43	3.986	1.0124	1.0825
44	4.153	1.0128	1.082
45	4.319	1.0127	1.0818
46	4.486	1.0121	1.0817
47	4.653	1.0117	1.0814
48	4.819	1.0121	1.0811
49	4.986	1.0123	1.081
50	5.153	1.0118	1.0808
51	5.319	1.0117	1.0808
52	5.486	1.0129	1.0804
53	5.652	1.012	1.0803
54	5.819	1.0127	1.0803
55	5.986	1.0124	1.0802
56	6.152	1.0119	1.0802
57	6.319	1.0122	1.0801
58	6.486	1.0123	1.08
59	6.652	1.0117	1.0798
60	6.819	1.0123	1.0798
61	6.986	1.0119	1.0797
62	7.152	1.0118	1.0798
63	7.319	1.0119	1.0797
64	7.502	1.0125	1.0799
65	7.686	1.012	1.0796
66	7.869	1.0128	1.0796

67	8.052	1.0117	1.0796
68	8.236	1.0129	1.0796
69	8.419	1.0119	1.0796
70	8.602	1.012	1.0797
71	8.786	1.0124	1.0796
72	8.969	1.0122	1.0795
73	9.152	1.0127	1.0796
74	9.336	1.012	1.0795
75	9.519	1.0125	1.0795
76	9.702	1.0124	1.0796
77	9.886	1.0128	1.0796
78	10.07	1.0121	1.0794
79	10.25	1.0124	1.0794
80	10.44	1.0123	1.0795
81	10.62	1.0129	1.0796
82	10.8	1.0127	1.0795
83	10.99	1.0122	1.0794
84	11.17	1.0123	1.0796
85	11.35	1.0124	1.0794
86	11.54	1.012	1.0794
87	11.72	1.0133	1.0793
88	11.9	1.0121	1.0795
89	12.09	1.0126	1.0794
90	12.27	1.0123	1.0794
91	12.47	1.0122	1.0791
92	12.67	1.012	1.0793
93	12.87	1.0128	1.0794
94	13.07	1.0122	1.0793
95	13.27	1.0127	1.0794
96	13.47	1.0125	1.0795
97	13.67	1.0121	1.0793
98	13.87	1.0123	1.0795
99	14.07	1.0121	1.0793
100	14.27	1.0129	1.0792
101	14.47	1.0126	1.0794
102	14.67	1.0125	1.0793
103	14.87	1.0124	1.0794
104	15.07	1.0121	1.0794
105	15.27	1.0126	1.0794
106	15.47	1.0124	1.0793
107	15.67	1.0117	1.0793
108	15.87	1.0126	1.0793
109	16.07	1.0122	1.0793
110	16.27	1.0131	1.0794

111	16.47	1.0125	1.0795
112	16.67	1.0128	1.0794
113	16.87	1.0128	1.0794
114	17.07	1.0123	1.0795
115	17.29	1.0124	1.0793
116	17.5	1.0128	1.0795
117	17.72	1.0132	1.0794
118	17.94	1.0127	1.0793
119	18.15	1.0124	1.0794
120	18.37	1.0119	1.0794
121	18.59	1.012	1.0793
122	18.8	1.0126	1.0793
123	19.02	1.0125	1.0792
124	19.24	1.013	1.0793
125	19.45	1.012	1.0793
126	19.67	1.0126	1.0793
127	19.89	1.0126	1.0793
128	20.1	1.0122	1.0793
129	20.32	1.0132	1.0793
130	20.54	1.0121	1.0792
131	20.75	1.0124	1.0792
132	20.97	1.0121	1.0793
133	21.18	1.0125	1.0792
134	21.4	1.0126	1.0792
135	21.62	1.0128	1.0793
136	21.85	1.0129	1.0791
137	22.08	1.0132	1.0791
138	22.32	1.0123	1.0792
139	22.55	1.0128	1.0792
140	22.78	1.012	1.0792
141	23.02	1.0124	1.0794
142	23.25	1.013	1.0792
143	23.48	1.0121	1.0792
144	23.72	1.0124	1.0791
145	23.95	1.0119	1.0792
146	24.18	1.013	1.0792
147	24.42	1.0129	1.0792
148	24.65	1.0133	1.0792
149	24.88	1.0123	1.0791
150	25.12	1.0124	1.0791
151	25.35	1.0131	1.079
152	25.58	1.0122	1.0792
153	25.82	1.013	1.0791
154	26.05	1.0131	1.0793

155	26.3	1.0118	1.0794
156	26.55	1.0123	1.0793
157	26.8	1.0125	1.0789
158	27.05	1.0127	1.0793
159	27.3	1.0125	1.0793
160	27.55	1.0122	1.0793
161	27.8	1.0117	1.0791
162	28.05	1.0124	1.0793
163	28.3	1.0125	1.0793
164	28.55	1.0131	1.0793
165	28.8	1.0125	1.0792
166	29.05	1.0124	1.0792
167	29.3	1.0124	1.0792
168	29.55	1.0122	1.0792
169	29.8	1.0124	1.0791
170	30.05	1.0125	1.0792
171	30.3	1.0127	1.0792
172	30.57	1.0124	1.0793
173	30.83	1.013	1.0791
174	31.1	1.0124	1.0792
175	31.37	1.0125	1.0793
176	31.63	1.0124	1.0791
177	31.9	1.0121	1.0791
178	32.17	1.0126	1.0791
179	32.43	1.0119	1.0793
180	32.7	1.0118	1.0793
181	32.97	1.0129	1.0793
182	33.23	1.0125	1.0791
183	33.5	1.0129	1.0791
184	33.77	1.0124	1.0792
185	34.03	1.0125	1.079
186	34.3	1.0129	1.0792
187	34.57	1.0125	1.079
188	34.83	1.0122	1.079
189	35.12	1.0125	1.079
190	35.4	1.0119	1.0791
191	35.68	1.0125	1.0791
192	35.97	1.0126	1.0792
193	36.25	1.0128	1.0791
194	36.53	1.0122	1.0791
195	36.82	1.0122	1.0793
196	37.1	1.0121	1.0791
197	37.38	1.0123	1.0791
198	37.67	1.0127	1.0791

199	37.95	1.0124	1.0789
200	38.23	1.0126	1.0793
201	38.52	1.0122	1.0792
202	38.8	1.0119	1.0791
203	39.1	1.0117	1.0791
204	39.4	1.0121	1.0792
205	39.7	1.0114	1.0793
206	40	1.012	1.0792
207	40.3	1.0122	1.0793
208	40.6	1.0122	1.0791
209	40.9	1.0119	1.079
210	41.2	1.0127	1.079
211	41.5	1.0121	1.0791
212	41.8	1.0125	1.0791
213	42.1	1.0125	1.0792
214	42.4	1.0129	1.079
215	42.7	1.0117	1.0792
216	43	1.0126	1.0791
217	43.32	1.0122	1.0792
218	43.63	1.0113	1.0791
219	43.95	1.0131	1.0792
220	44.27	1.0125	1.0791
221	44.58	1.0125	1.079
222	44.9	1.0125	1.0791
223	45.22	1.0124	1.079
224	45.53	1.0135	1.0791
225	45.85	1.0119	1.0791
226	46.17	1.0125	1.0791
227	46.48	1.013	1.0792
228	46.8	1.012	1.0791
229	47.12	1.0125	1.0792
230	47.45	1.0129	1.0791
231	47.78	1.0126	1.079
232	48.12	1.013	1.0791
233	48.45	1.013	1.0791
234	48.78	1.012	1.079
235	49.12	1.012	1.0793
236	49.45	1.0125	1.0792
237	49.78	1.0127	1.0792
238	50.12	1.0134	1.0792
239	50.45	1.0123	1.0792
240	50.78	1.0137	1.0793
241	51.12	1.0115	1.0791
242	51.47	1.0124	1.0789

243	51.82	1.012	1.0791
244	52.17	1.0131	1.0792
245	52.52	1.0122	1.0791
246	52.87	1.0123	1.079
247	53.22	1.0112	1.079
248	53.57	1.0118	1.0789
249	53.92	1.013	1.0789
250	54.27	1.0122	1.079
251	54.62	1.0123	1.0789
252	54.97	1.0121	1.0791
253	55.32	1.0117	1.079
254	55.68	1.0136	1.079
255	56.05	1.0123	1.079
256	56.42	1.0116	1.0791
257	56.78	1.013	1.0791
258	57.15	1.0123	1.0791
259	57.52	1.0128	1.079
260	57.88	1.012	1.0792
261	58.25	1.0123	1.0789
262	58.62	1.0136	1.079
263	58.98	1.0127	1.079
264	59.35	1.0117	1.0791
265	59.73	1.0116	1.079
266	60.12	1.0125	1.079
267	60.5	1.0122	1.0791
268	60.88	1.0124	1.0792
269	61.27	1.0123	1.0792
270	61.65	1.0119	1.0792
271	62.03	1.012	1.0792
272	62.42	1.0118	1.0793
273	62.8	1.0126	1.079
274	63.18	1.0123	1.079
275	63.58	1.0122	1.0791
276	63.98	1.0118	1.0789
277	64.38	1.0123	1.0789
278	61.78	1.0123	1.079
279	65.18	1.0127	1,0789
280	65.58	1.0124	1.0791
281	65.98	1.0128	1.0791
282	66.38	1.0126	1.0792
283	66.78	1.0123	1.0791
284	67.18	1.0124	1.079
285	67.6	1.0128	1.0791
286	68.02	1.0128	1.0792

287	68.43	1.0117	1.0791
288	68.85	1.0129	1.0791
289	69.27	1.012	1.0791
290	69.68	1.0115	1.079
291	70.1	1.012	1.0791
292	70.52	1.0123	1.0792
293	70.93	1.0121	1.0792
294	71.37	1.0126	1.0792
295	71.8	1.0125	1.0792
296	72.23	1.013	1.079
297	72.67	1.0124	1.079
298	73.1	1.0128	1.079
299	73.53	1.0128	1.079
300	73.97	1.0121	1.0788
301	74.4	1.0125	1.0788
302	74.83	1.0129	1.0789
303	75.28	1.0126	1.0792
304	75.73	1.0119	1.0791
305	76.18	1.0119	1.0791
306	76.63	1.0121	1.079
307	77.08	1.0121	1.0792
308	77.53	1.0128	1.0791
309	77.98	1.0123	1.079
310	78.43	1.0127	1.079
311	78.9	1.0121	1.0791
312	79.37	1.0127	1.079
313	79.83	1.0115	1.0791
314	80.3	1.0126	1.0789
315	80.77	1.0127	1.0788
316	81.23	1.0124	1.0789
317	81.7	1.0122	1.079
318	82.17	1.0122	1.079
319	82.63	1.0122	1.0793
320	83.12	1.0127	1.079
321	83.6	1.0127	1.0789
322	84.08	1.0121	1.0792
323	84.57	1.0124	1.0791
324	85.05	1.0133	1.0791
325	85.53	1.0124	1.0791
326	86.02	1.0119	1.0789
327	86.52	1.0127	1.0791
328	87.02	1.0116	1.0792
329	87.52	1.0132	1.0792
330	88.02	1.0123	1.0791

331	88.52	1.0116	1.0788
332	89.02	1.0114	1.0792
333	89.52	1.0131	1.0792
334	90.02	1.0122	1.0791
335	90.53	1.0114	1.0791
336	91.05	1.0133	1.079
337	91.57	1.0123	1.0789
338	92.08	1.0107	1.079
339	92.6	1.0116	1.0793
340	93.12	1.0129	1.0793
341	93.63	1.0132	1.0789
342	94.17	1.012	1.0789
343	94.7	1.0118	1.0789
344	95.23	1.0121	1.0789
345	95.77	1.0114	1.0791
346	96.3	1.0118	1.0791
347	96.83	1.0116	1.0791
348	97.37	1.0119	1.079
349	97.92	1.0117	1.0792
350	98.47	1.012	1.0792
351	99.02	1.0122	1.079
352	99.57	1.0119	1.0791
353	100.1	1.0117	1.079
354	100.7	1.0117	1.0792
355	101.2	1.0121	1.079
356	101.8	1.0108	1.0791
357	102.3	1.0121	1.0789
358	102.9	1.0124	1.079
359	103.5	1.0123	1.079
360	104	1.0116	1.0791
361	104.6	1.0115	1.0791
362	105.2	1.0121	1.0792
363	105.8	1.0125	1.0789
364	106.3	1.0122	1.0792
365	106.9	1.0121	1.079
366	107.5	1.0123	1.0789
367	108.1	1.0125	1.079
368	108.7	1.0111	1.0789
369	109.3	1.0121	1.0791
370	109.9	1.0121	1.079
371	110.5	1.0112	1.079
372	111.1	1.012	1.079
373	111.7	1.012	1.0789
374	112.3	1.0115	1.0791

375	112.9	1.0123	1.0791
376	113.5	1.0113	1.079
377	114.1	1.0119	1.079
378	114.7	1.0116	1.0793
379	115.4	1.0124	1.079
380	116	1.0109	1.079
381	116.6	1.0119	1.079
382	117.2	1.0114	1.0793
383	117.9	1.012	1.079
384	118.5	1.0121	1.079
385	119.1	1.0123	1.0789
386	119.8	1.0114	1.0789
387	120.4	1.0128	1.079
388	121.1	1.0122	1.079
389	121.7	1.0119	1.079
390	122.4	1.0122	1.0789
391	123	1.0126	1.0792
392	123.7	1.0119	1.0792
393	124.3	1.0123	1.0789
394	125	1.0116	1.0791
395	125.7	1.0127	1.0794
396	126.3	1.0129	1.0789
397	127	1.0118	1.0793
398	127.7	1.0118	1.0789
399	128.4	1.0128	1.079
400	129.1	1.0121	1.0792
401	129.7	1.0127	1.0791
402	130.4	1.0127	1.079
403	131.1	1.0127	1.0793
404	131.8	1.0128	1.0787
405	132.5	1.013	1.0791
406	133.2	1.0126	1.0793
407	133.9	1.0121	1.0789
408	134.6	1.0115	1.079
409	135.3	1.0114	1.0789
410	136	1.0127	1.0791
411	136.8	1.0118	1.079
412	137.5	1.0121	1.0792
413	138.2	1.0136	1.0792
414	138.9	1.0122	1.0792
415	139.7	1.0125	1.0794
416	140.4	1.0124	1.0791
417	141.1	1.0116	1.0792
418	141.9	1.0126	1.0791

419	142.6	1.0126	1.0793
420	143.4	1.013	1.0789
421	144.1	1.0127	1.0792
422	144.9	1.0117	1.0788
423	145.6	1.0127	1.0791
424	146.4	1.0117	1.0789
425	147.1	1.0118	1.0791
426	147.9	1.0131	1.079
427	148.7	1.0116	1.0791
428	149.5	1.0123	1.0789
429	150.2	1.0125	1.0791
430	151	1.0118	1.0789
431	151.8	1.0134	1.0788
432	152.6	1.0124	1.079
433	153.4	1.0119	1.0787
434	154.2	1.013	1.079
435	155	1.0124	1.0791
436	155.8	1.0124	1.0791
437	156.6	1.0127	1.0788
438	157.4	1.0122	1.079
439	158.2	1.0113	1.0791
440	159.1	1.0128	1.0788
441	159.9	1.0134	1.0786
442	160.7	1.0124	1.0788
443	161.5	1.0118	1.0788
444	162.4	1.0117	1.0788
445	163.2	1.0137	1.0789
446	164.1	1.0126	1.0787
447	164.9	1.0125	1.0788
448	165.8	1.0116	1.0789
449	166.6	1.0135	1.0788
450	167.5	1.0124	1.0789
451	168.3	1.0131	1.0787
452	169.2	1.0127	1.0789
453	170.1	1.0116	1.079
454	170.9	1.0131	1.0789
455	171.8	1.0117	1.0789
456	172.7	1.0122	1.079
457	173.6	1.0129	1.0787
458	174.5	1.0132	1.0789
459	175.4	1.0124	1.0791
460	176.3	1.0127	1.0788
461	177.2	1.0121	1.0787
462	178.1	1.0117	1.0788

463	179	1.0129	1.0788
464	179.9	1.0123	1.0788
465	180.8	1.0123	1.0788
466	181.8	1.0126	1.0789
467	182.7	1.0124	1.0789
468	183.6	1.0127	1.0788
469	184.6	1.0115	1.0789
470	185.5	1.0127	1.0788
471	186.5	1.0128	1.0788
472	187.4	1.0132	1.0787
473	188.4	1.0126	1.0786
474	189.3	1.0122	1.0787
475	190.3	1.0128	1.0785
476	191.3	1.0128	1.0787
477	192.2	1.0118	1.0787
478	193.2	1.0124	1.0787
479	194.2	1.0126	1.0787
480	195.2	1.0122	1.0789
481	196.2	1.0119	1.0787
482	197.2	1.012	1.0791
483	198.2	1.0112	1.0787
484	199.2	1.0121	1.0791
485	200.2	1.0117	1.079
486	201.2	1.0121	1.0789
487	202.2	1.0128	1.0789
488	203.3	1.0134	1.0789
489	204.3	1.0127	1.0787
490	205.3	1.012	1.0787
491	206.4	1.0117	1.0792
492	207.4	1.0119	1.0789
493	208.5	1.0121	1.079
494	209.5	1.0123	1.0791
495	210.6	1.0117	1.0788
496	211.6	1.0123	1.0789
497	212.7	1.0117	1.079
498	213.8	1.0121	1.0788
499	214.9	1.0121	1.0791
500	216	1.0125	1.0789
501	217	1.0121	1.0791
502	218.1	1.0129	1.0789
503	219.2	1.0123	1.0791
504	220.3	1.0118	1.079
505	221.5	1.0119	1.0793
506	222.6	1.0117	1.0789

507	223.7	1.0115	1.0788
508	224.8	1.0118	1.0789
509	226	1.0114	1.0791
510	227.1	1.0107	1.0788
511	228.2	1.0124	1.079
512	229.4	1.0118	1.0792
513	230.5	1.0114	1.0792
514	231.7	1.0133	1.0788
515	232.9	1.0116	1.0788
516	234	1.0115	1.0788
517	235.2	1.0117	1.0791
518	236.4	1.0126	1.0787
519	237.6	1.0121	1.0789
520	238.8	1.0108	1.0792
521	240	1.0122	1.0791
522	241.2	1.0127	1.0788
523	242.4	1.0113	1.0789
524	243.6	1.013	1.0789
525	244.8	1.0117	1.079
526	246.1	1.0124	1.079
527	247.3	1.0124	1.0788
528	248.5	1.0123	1.0787
529	249.8	1.0119	1.0788
530	251	1.0118	1.0791
531	252.3	1.0123	1.0788
532	253.6	1.0127	1.0787
533	254.8	1.012	1.0788
534	256.1	1.0117	1.0788
535	257.4	1.0121	1.0791
536	258.7	1.0127	1.0791
537	260	1.0115	1.0789
538	261.3	1.0114	1.079
539	262.6	1.0125	1.079
540	263.9	1.0118	1.0789
541	265.2	1.0124	1.0788
542	266.5	1.0122	1.0788
543	267.9	1.0124	1.079
544	269.2	1.0127	1.0791
545	270.6	1.0124	1.0788
546	271.9	1.0124	1.0789
547	273.3	1.0123	1.0787
548	274.6	1.0141	1.0789
549	276	1.0122	1.079
550	277.4	1.013	1.0789

551	278.8	1.0128	1.0789
552	280.1	1.013	1.0788
553	281.5	1.0118	1.0789
554	282.9	1.0131	1.0789
555	284.4	1.0126	1.0792
556	285.8	1.0124	1.0791
557	287.2	1.0125	1.0789
558	288.6	1.0124	1.0785
559	290.1	1.012	1.0786
560	291.5	1.0132	1.0786
561	293	1.0137	1.0788
562	291.4	1.0114	1.0786
563	295.9	1.0119	1.0789
564	297.3	1.0127	1.0791
565	298.8	1.012	1.0788
566	300.3	1.0127	1.079
567	301.8	1.0118	1.0787
568	303.3	1.0136	1.0789
569	304.8	1.0116	1.0787
570	306.3	1.0119	1.0789
571	307.9	1.0127	1.0789
572	309.4	1.0133	1.0789
573	310.9	1.0135	1.0787
574	312.5	1.0132	1.0786
575	314	1.0122	1.0788
576	315.6	1.0133	1.0789
577	317.2	1.0124	1.0788
578	318.7	1.013	1.0788
579	320.3	1.0124	1.079
580	321.9	1.0131	1.0789
581	323.5	1.0132	1.0792
582	325.1	1.0126	1.0785
583	326.7	1.0114	1.0788
584	328.3	1.0127	1.0787
585	330	1.0126	1.079
586	331.6	1.0123	1.0787
587	333.2	1.0137	1.0788
588	334.9	1.0125	1.0787
589	336.6	1.0119	1.079
590	338.2	1.0112	1.0786
591	339.9	1.0116	1.0789
592	341.6	1.0123	1.0786
593	343.3	1.0111	1.0788
594	345	1.0133	1.0787

595	346.7	1.0117	1.0788
596	348.4	1.012	1.0785
597	350.1	1.0132	1.0791
598	351.9	1.0105	1.0788
599	353.6	1.0124	1.0786
600	355.3	1.0101	1.079
601	357.1	1.0101	1.079
602	358.9	1.0117	1.0787
603	360.6	1.011	1.0787
604	362.4	1.0105	1.0786
605	364.2	1.0132	1.0789
606	366	1.0112	1.0787
607	367.8	1.0114	1.0787
608	369.6	1.0119	1.079
609	371.5	1.012	1.0793
610	373.3	1.0128	1.0791
611	375.2	1.0119	1.0787
612	377	1.0125	1.0789
613	378.9	1.0117	1.079
614	380.7	1.012	1.0787
615	382.6	1.0106	1.0788
616	384.5	1.0129	1.0789
617	386.4	1.0115	1.0791
618	388.3	1.0102	1.0787
619	390.2	1.0121	1.079
620	392.2	1.0105	1.0789
621	394.1	1.0112	1.0789
622	396	1.0109	1.0786
623	398	1.0094	1.0785
624	400	1.0112	1.0785
625	401.9	1.0111	1.0789
626	403.9	1.0118	1.0787
627	405.9	1.0083	1.0789
628	407.9	1.01	1.0786
629	409.9	1.0102	1.0787
630	411.9	1.012	1.0789
631	414	1.0124	1.0787
632	416	1.0103	1.079
633	418.1	1.0099	1.0788
634	420.1	1.0124	1.079
635	422.2	1.0099	1.0787
636	424.3	1.011	1.0788
637	426.4	1.01	1.0782
638	428.5	1.0081	1.0786

639	430.6	1.0122	1.0794
640	432.7	1.0102	1.079
641	434.9	1.0116	1.0785
642	437	1.0105	1.079
643	439.2	1.0135	1.0792
644	441.3	1.0139	1.0793
645	443.5	1.0126	1.0789
646	445.7	1.0129	1.079
647	447.9	1.007	1.0786
648	450.1	1.0093	1.0787
649	452.3	1.0135	1.0798
650	454.5	1.0114	1.0787
651	456.8	1.0154	1.0798
652	459	1.0165	1.0792
653	461.3	1.0116	1.079
654	463.5	1.0168	1.0797
655	465.8	1.0136	1.0792
656	468.1	1.0093	1.0789
657	470.4	1.0135	1.0793
658	472.7	1.0117	1.0792
659	475.1	1.0135	1.0792
660	477.4	1.013	1.0791
661	479.8	1.0136	1.0794
662	482.1	1.0113	1.0783
663	484.5	1.0108	1.0789
664	486.9	1.0143	1.0793
665	489.3	1.011	1.0788
666	491.7	1.0149	1.0797
667	494.1	1.0128	1.0794
668	496.5	1.0149	1.0791
669	499	1.0113	1.0791
670	501.4	1.0111	1.0788
671	503.9	1.0142	1.0793
672	506.4	1.0126	1.0793
673	508.9	1.0119	1.0794
674	511.4	1.0126	1.0791
675	513.9	1.009	1.0786
676	516.4	1.0106	1.0786
677	519	1.0108	1.0781
678	521.5	1.0127	1.0793
679	524.1	1.0113	1.0787
680	526.7	1.0133	1.0793
681	529.3	1.0138	1.0792
682	531.9	1.0116	1.0786

683	534.5	1.0133	1.0796
684	537.1	1.0148	1.0796
685	539.8	1.0116	1.0786
686	542.4	1.0073	1.0784

GEYSERS GEOTHERMAL FIELD
WELL OF52-11 5000-5200 FT, SIZE 10-150 MESH

	Bottom	Top
The steam charge (volts):	0.771	0.7548
The steam charge (bars):	1.63317	1.73842
The steam charge (P/Pz):	0.868243	0.85
The calibration (volts):	0.9666	0.889
The pressure of the atmosphere (volts):	0.4809	0.472
The pressure of the atmosphere (bars):	1.01867	1.08709
The vacuum reading (volts) after the run:	-4.30E-03	2.41E-02
The saturated vapor pressure of water (volts):	0.888	
The saturated vapor pressure of water (bars):	2.0452	
The temperature-(degrees kelvin) is:	394.1	
The calibration pressure (bars):	2.0475	
The geometric progression factor:	1005	
The # of samples per displayed point:	40	
The diameter of the sample (cm)	2.362	
The length of the sample (cm)	31.27	
The weight of the sample (gm)	214.567	
The permeability of the sample (darcys)	13.7	

	Time(sec)	Bottom(bars)	Top(bars)
1	4.29E-02	1.0293	1.7443
2	0.1143	1.0365	1.7431
3	0.1857	1.0285	1.7349
4	0.2573	1.0234	1.7161
5	0.3288	1.0222	1.6892
6	0.4002	1.0213	1.6594
7	0.4718	1.0224	1.6303
8	0.5432	1.0213	1.6019
9	0.6147	1.0223	1.5757
10	0.6862	1.0223	1.5518
11	0.7577	1.0219	1.5293
12	0.8292	1.0223	1.5079
13	0.9006	1.0226	1.4882
14	0.9722	1.0221	1.4696
15	1.044	1.0219	1.4523
16	1.115	1.0219	1.4357
17	1.187	1.0224	1.4205
18	1.258	1.021	1.4056
19	1.33	1.021	1.3921
20	1.401	1.0228	1.379
21	1.473	1.0216	1.3675
22	1.544	1.0229	1.3559

23	1.615	1.0225	1.3452
24	1.687	1.0224	1.3352
25	1.758	1.0222	1.3257
26	1.83	1.0225	1.3168
27	1.901	1.0226	1.3086
28	1.973	1.0215	1.3014
29	2.044	1.0218	1.2945
30	2.116	1.022	1.2874
31	2.187	1.0219	1.2809
32	2.259	1.0222	1.2747
33	2.33	1.0216	1.2688
34	2.49	1.0221	1.2554
35	2.656	1.0222	1.2424
36	2.823	1.0223	1.2309
37	2.99	1.0218	1.22
38	3.156	1.0225	1.2098
39	3.323	1.022	1.201
40	3.49	1.0212	1.1923
41	3.656	1.0216	1.1841
42	3.823	1.0211	1.1775
43	3.989	1.022	1.1703
44	4.156	1.022	1.164
45	4.323	1.0208	1.1586
46	4.489	1.0218	1.1535
47	4.656	1.0219	1.1486
48	4.823	1.0209	1.1442
49	4.989	1.0213	1.1404
50	5.156	1.021	1.1366
51	5.323	1.0202	1.1328
52	5.489	1.0219	1.13
53	5.656	1.0211	1.1271
54	5.823	1.0217	1.1248
55	5.989	1.021	1.1217
56	6.156	1.0213	1.1196
57	6.323	1.0218	1.1174
58	6.489	1.0224	1.1153
59	6.656	1.0212	1.1136
60	6.823	1.0217	1.1119
61	6.989	1.0223	1.1105
62	7.156	1.021	1.1092
63	7.323	1.0221	1.1079
64	7.506	1.0217	1.1064
65	7.689	1.0217	1.1051
66	7.873	1.0213	1.1044

67	8.056	1.0217	1.103
68	8.239	1.0227	1.1021
69	8.423	1.0211	1.101
70	8.606	1.021	1.1001
71	8.789	1.0216	1.0995
72	8.973	1.0226	1.0989
73	9.156	1.0212	1.0983
74	9.339	1.0224	1.0974
75	9.523	1.0212	1.097
76	9.706	1.0217	1.0966
77	9.889	1.0212	1.0964
78	10.07	1.0204	1.0957
79	10.26	1.0211	1.0953
80	10.44	1.021	1.0951
81	10.62	1.0206	1.0945
82	10.81	1.0215	1.0943
83	10.99	1.0204	1.0939
84	11.17	1.0217	1.0936
85	11.36	1.0222	1.0936
86	11.54	1.0214	1.0931
87	11.72	1.0214	1.093
88	11.91	1.022	1.0928
89	12.09	1.0209	1.0925
90	12.27	1.0216	1.0923
91	12.47	1.0213	1.092
92	12.67	1.0218	1.0919
93	12.87	1.0207	1.0916
94	13.07	1.0217	1.0915
95	13.27	1.0209	1.0911
96	13.47	1.0218	1.0912
97	13.67	1.0212	1.091
98	13.87	1.022	1.0908
99	14.07	1.0216	1.0909
100	14.27	1.0225	1.0904
101	14.47	1.0224	1.0906
102	14.67	1.0217	1.09
103	14.87	1.0218	1.09
104	15.07	1.021	1.0902
105	15.27	1.0222	1.0898
106	15.47	1.0212	1.0901
107	15.67	1.0206	1.0898
108	15.87	1.0219	1.0901
109	16.07	1.0213	1.0899
110	16.27	1.0205	1.0895

111	16.47	1.0215	1.0895
112	16.67	1.0211	1.0895
113	16.87	1.0211	1.0894
114	17.07	1.0216	1.0892
115	17.29	1.0207	1.0893
116	17.51	1.021	1.0892
117	17.72	1.0214	1.0893
118	17.94	1.0207	1.0892
119	18.16	1.0212	1.0889
120	18.37	1.022	1.0893
121	18.59	1.0206	1.089
122	18.81	1.0219	1.089
123	19.02	1.0211	1.0889
124	19.24	1.0211	1.0891
125	19.46	1.0214	1.0887
126	19.67	1.0213	1.0885
127	19.89	1.0209	1.0889
128	20.11	1.0209	1.0883
129	20.32	1.0211	1.0887
130	20.54	1.0213	1.0885
131	20.76	1.0204	1.0884
132	20.97	1.0217	1.0886
133	21.19	1.0209	1.0885
134	21.41	1.0206	1.0884
135	21.62	1.0211	1.0884
136	21.86	1.0214	1.0885
137	22.09	1.0213	1.0884
138	22.32	1.0219	1.0884
139	22.56	1.0212	1.0884
140	22.79	1.0212	1.0882
141	23.02	1.021	1.0885
142	23.26	1.0219	1.0883
143	23.49	1.0211	1.0883
144	23.72	1.0218	1.0882
145	23.96	1.0215	1.0883
146	24.19	1.0218	1.0881
147	24.42	1.0213	1.0884
148	24.66	1.0207	1.0881
149	24.89	1.0221	1.0879
150	25.12	1.0216	1.0882
151	25.36	1.0206	1.0882
152	25.59	1.021	1.0878
153	25.82	1.0211	1.0879
154	26.05	1.0212	1.0881

155	26.3	1.0212	1.0883
156	26.55	1.0214	1.0879
157	26.8	1.021	1.0881
158	27.05	1.0208	1.088
159	27.3	1.0216	1.0879
160	27.55	1.0205	1.088
161	27.8	1.0216	1.0879
162	28.05	1.0216	1.0882
163	28.3	1.021	1.0878
164	28.55	1.0208	1.0881
165	28.8	1.022	1.0879
166	29.05	1.0213	1.088
167	29.3	1.0213	1.0879
168	29.55	1.0213	1.088
169	29.8	1.0207	1.0876
170	30.05	1.0218	1.0879
171	30.3	1.0206	1.0876
172	30.57	1.0216	1.0878
173	30.84	1.0212	1.088
174	31.1	1.0215	1.0875
175	31.37	1.021	1.088
176	31.64	1.0209	1.0879
177	31.9	1.0217	1.0879
178	32.17	1.0213	1.0877
179	32.44	1.0207	1.0878
180	32.7	1.0218	1.0877
181	32.97	1.0219	1.0881
182	33.24	1.0204	1.0875
183	33.5	1.0206	1.0877
184	33.77	1.0205	1.0877
185	34.04	1.0219	1.0877
186	34.3	1.0215	1.0878
187	34.57	1.0213	1.0876
188	34.84	1.0215	1.0877
189	35.12	1.0208	1.0877
190	35.4	1.0212	1.0876
191	35.69	1.0208	1.0875
192	35.97	1.0213	1.0875
193	36.25	1.0211	1.0873
194	36.54	1.0201	1.0875
195	36.82	1.0215	1.0875
196	37.1	1.0207	1.0875
197	37.39	1.0205	1.0874
198	37.67	1.0202	1.0874

199	37.95	1.0214	1.0877
200	38.24	1.0213	1.0878
201	38.52	1.0214	1.0878
202	38.8	1.022	1.0875
203	39.1	1.0208	1.0876
204	39.4	1.0211	1.0876
205	39.7	1.0211	1.0877
206	40	1.0208	1.0874
207	40.3	1.0215	1.0875
208	40.6	1.0211	1.0875
209	40.9	1.0212	1.0875
210	41.2	1.0213	1.0873
211	41.5	1.0217	1.0876
212	41.8	1.0208	1.0876
213	42.1	1.0218	1.0875
214	42.4	1.0207	1.0874
215	42.7	1.0222	1.0873
216	43	1.0214	1.0873
217	43.32	1.0214	1.087
218	43.64	1.0221	1.0875
219	43.95	1.0206	1.0874
220	44.27	1.0206	1.0876
221	44.59	1.0205	1.0873
222	44.9	1.0205	1.0872
223	45.22	1.021	1.0873
224	45.54	1.0209	1.0873
225	45.85	1.0213	1.0876
226	46.17	1.0211	1.0873
227	46.49	1.0213	1.0873
228	46.8	1.0214	1.0874
229	47.12	1.0206	1.0873
230	47.45	1.0214	1.0873
231	47.79	1.0211	1.0874
232	48.12	1.0206	1.087
233	48.45	1.0214	1.0872
234	48.79	1.021	1.0872
235	49.12	1.0218	1.0874
236	49.45	1.021	1.0871
237	49.78	1.0204	1.0872
238	50.12	1.021	1.0872
239	50.45	1.0212	1.0873
240	50.78	1.0215	1.0872
241	51.12	1.0211	1.0872
242	51.47	1.0222	1.0872

243	51.82	1.021	1.0872
244	52.17	1.0217	1.087
245	52.52	1.0214	1.0869
246	52.87	1.0218	1.0871
247	53.22	1.0216	1.0872
248	53.57	1.0218	1.0871
249	53.92	1.0215	1.0875
250	54.27	1.0214	1.0873
251	54.62	1.0219	1.0868
252	54.97	1.0209	1.0874
253	55.32	1.0214	1.0869
254	55.68	1.0216	1.0873
255	56.05	1.0212	1.0869
256	56.42	1.0215	1.0871
257	56.78	1.0215	1.0872
258	57.15	1.0217	1.087
259	57.52	1.0219	1.0872
260	57.88	1.0214	1.0873
261	58.25	1.0209	1.0871
262	58.62	1.0209	1.0872
263	58.98	1.0213	1.0868
264	59.35	1.0212	1.0874
265	59.73	1.0219	1.0872
266	60.12	1.0219	1.087
267	60.5	1.0211	1.0873
268	60.88	1.0214	1.0872
269	61.27	1.0212	1.0872
270	61.65	1.021	1.0872
271	62.03	1.021	1.0872
272	62.42	1.0214	1.0871
273	62.8	1.0216	1.0871
274	63.18	1.0207	1.0871
275	63.58	1.0203	1.0871
276	63.98	1.0222	1.0873
277	64.38	1.0214	1.0873
278	64.78	1.0205	1.0869
279	65.18	1.0205	1.0868
280	65.58	1.0216	1.0872
281	65.98	1.0206	1.0868
282	66.38	1.0209	1.0871
283	66.78	1.0207	1.0868
284	67.18	1.0207	1.0869
285	67.6	1.0208	1.0873
286	68.01	1.0202	1.0868

287	68.43	1.0213	1.0873
288	68.85	1.0208	1.0871
289	69.26	1.0208	1.0871
290	69.68	1.0206	1.0874
291	70.1	1.0215	1.087
292	70.51	1.0205	1.0872
293	70.93	1.0208	1.0871
294	71.36	1.0212	1.0871
295	71.8	1.0198	1.0871
296	72.23	1.021	1.0872
297	72.66	1.0227	1.0873
298	73.1	1.0205	1.087
299	73.53	1.0206	1.0868
300	73.96	1.0216	1.0871
301	74.4	1.0211	1.0873
302	74.83	1.0202	1.0869
303	75.28	1.0198	1.087
304	75.73	1.0203	1.0871
305	76.18	1.0211	1.0871
306	76.63	1.02	1.0869
307	77.08	1.0219	1.0871
308	77.53	1.021	1.0873
309	77.98	1.021	1.0869
310	78.43	1.0217	1.0872
311	78.9	1.0191	1.0869
312	79.36	1.0211	1.0873
313	79.83	1.0203	1.0871
314	80.3	1.0206	1.087
315	80.76	1.0217	1.0873
316	81.23	1.0216	1.0874
317	81.7	1.0211	1.0873
318	82.16	1.0219	1.0874
319	82.63	1.0207	1.0869
320	83.11	1.0214	1.0869
321	83.6	1.0215	1.0871
322	84.08	1.0195	1.0871
323	84.56	1.0202	1.0867
324	85.05	1.0204	1.087
325	85.53	1.0217	1.0872
326	86.01	1.0204	1.0869
327	86.51	1.0212	1.0873
328	87.01	1.0217	1.0872
329	87.51	1.0217	1.087
330	88.01	1.0212	1.0871

331	88.51	1.0208	1.0871
332	89.01	1.0206	1.0869
333	89.51	1.021	1.0872
334	90.01	1.0219	1.0872
335	90.53	1.021	1.0871
336	91.05	1.021	1.0872
337	91.56	1.0211	1.0871
338	92.08	1.0198	1.0869
339	92.6	1.0208	1.087
340	93.11	1.0202	1.0868
341	93.63	1.0201	1.0867
342	94.16	1.0213	1.0869
343	94.7	1.0204	1.0868
344	95.23	1.0214	1.0868
345	95.76	1.0215	1.0869
346	96.29	1.0209	1.0867
347	96.83	1.0211	1.087
348	97.36	1.0212	1.087
349	97.91	1.0194	1.0865
350	98.46	3.0211	1.0868
351	99.01	1.0223	1.0872
352	99.56	1.021	1.0869
353	100.1	1.0211	1.0872
354	100.7	1.0216	1.0871
355	101.2	1.0197	1.0867
356	101.8	1.0204	1.0866
357	102.3	1.0219	1.0873
358	102.9	1.0195	1.0867
359	103.5	1.0212	1.087
360	104	1.0221	1.0869
361	104.6	1.0215	1.0866
362	105.2	1.0204	1.0866
363	105.8	1.0199	1.0868
364	106.3	1.0214	1.0872
365	106.9	1.021	1.0871
366	107.5	1.0196	1.0868
367	108.1	1.0214	1.0867
368	108.7	1.0202	1.0868
369	109.3	1.0212	1.0869
370	109.9	1.021	1.087
371	110.5	1.0211	1.0871
372	111.1	1.0218	1.087
373	111.7	1.0221	1.0874
374	112.3	1.0203	1.0868

375	112.9	1.0207	1.087
376	113.5	1.0198	1.0868
377	114.1	1.0197	1.0868
378	114.7	1.0207	1.0871
379	115.4	1.0216	1.087
380	116	1.0207	1.0869
381	116.6	1.023	1.0874
382	117.2	1.0222	1.0872
383	117.9	1.0213	1.0872
384	118.5	1.0226	1.0874
385	119.1	1.0215	1.0871
386	119.8	1.0226	1.0871
387	120.4	1.0204	1.0865
388	121.1	1.0217	1.0872
389	121.7	1.0205	1.0871
390	122.4	1.0211	1.0872
391	123	1.0212	1.0872
392	123.7	1.0215	1.0872
393	124.3	1.0224	1.0872
394	125	1.0207	1.0868
395	125.7	1.0198	1.0869
396	126.3	1.0211	1.0873
397	127	1.0196	1.0867
398	127.7	1.0217	1.0869
399	128.4	1.021	1.0873
400	129.1	1.0206	1.0871
401	129.7	1.0211	1.0867
402	130.4	1.0207	1.0867
403	131.1	1.021	1.0868
404	131.8	1.0213	1.087
405	132.5	1.0219	1.0872
406	133.2	1.0202	1.0868
407	133.9	1.0199	1.0868
408	134.6	1.0212	1.0869
409	135.3	1.0211	1.0869
410	136	1.0205	1.087
411	136.8	1.0202	1.0866
412	137.5	1.0201	1.0868
413	138.2	1.0205	1.0869
414	138.9	1.0207	1.0868
415	139.7	1.0211	1.0869
416	140.4	1.0217	1.0866
417	141.1	1.0217	1.0871
418	141.9	1.0211	1.0872

419	142.6	1.0209	1.087
420	143.4	1.0211	1.0869
421	144.1	1.0214	1.0871
422	144.9	1.0217	1.0869
423	145.6	1.0207	1.0868
424	146.4	1.0214	1.0871
425	147.1	1.0202	1.0868
426	147.9	1.0205	1.087
427	148.7	1.0205	1.0866
428	149.5	1.0201	1.0863
429	150.2	1.0212	1.0869
430	151	1.0205	1.0865
431	151.8	1.0207	1.0867
432	152.6	1.0206	1.0869
433	153.4	1.0221	1.087
434	154.2	1.0201	1.0869
435	155	1.0209	1.087
436	155.8	1.0218	1.0871
437	156.6	1.0195	1.0868
438	157.4	1.0214	1.0869
439	158.2	1.0194	1.0865
440	159.1	1.0215	1.0868
441	159.9	1.021	1.0868
442	160.7	1.0225	1.0872
443	161.5	1.0215	1.087
444	162.4	1.0218	1.0871
445	163.2	1.0216	1.087
446	164.1	1.0212	1.0868
447	164.9	1.0217	1.0873
448	165.8	1.0202	1.0867
449	166.6	1.0212	1.087
450	167.5	1.021	1.0869
451	168.3	1.0193	1.0865
452	169.2	1.0197	1.0867
453	170.1	1.0213	1.0869
454	170.9	1.0206	1.087
455	171.8	1.0218	1.0871
456	172.7	1.0198	1.0866
457	173.6	1.0197	1.0869
458	174.5	1.0205	1.087
459	175.4	1.02	1.0868
460	176.3	1.0207	1.0869
461	177.2	1.0211	1.0871
462	178.1	1.0203	1.0869

463	179	1.0206	1.0867
464	179.9	1.0196	1.0868
465	180.8	1.0221	1.0871
466	181.8	1.0208	1.0867
467	182.7	1.021	1.0868
468	183.6	1.0203	1.0869
469	184.6	1.0202	1.087
470	185.5	1.0198	1.0867
471	186.5	1.0204	1.0868
472	187.4	1.0196	1.0868
473	188.4	1.0217	1.0873
474	189.3	1.0203	1.0868
475	190.3	1.0203	1.0868
476	191.3	1.0216	1.0872
477	192.2	1.0205	1.0866
478	193.2	1.0199	1.0867
479	194.2	1.0221	1.087
480	195.2	1.0229	1.0872
481	196.2	1.0206	1.087
482	197.2	1.0218	1.087
483	198.2	1.021	1.087
484	199.2	1.0203	1.0868
485	200.2	1.0207	1.087
486	201.2	1.0201	1.0866
487	202.2	1.0206	1.0868
488	203.3	1.0209	1.0869
489	204.3	1.0206	1.0866
490	205.3	1.0211	1.0868
491	206.4	1.022	1.0871
492	207.4	1.0197	1.0868
493	208.5	1.0198	1.0868
494	209.5	1.0201	1.0871
495	210.6	1.0212	1.0867
496	211.6	1.0212	1.0869
497	212.7	1.0208	1.0871
498	213.8	1.0207	1.0867
499	214.9	1.0203	1.087
500	216	1.0211	1.0868
501	217	1.0209	1.0867
502	218.1	1.0201	1.0867
503	219.2	1.0202	1.0865
504	220.3	1.0204	1.0864
505	221.5	1.0215	1.087
506	222.6	1.021	1.0868

507	223.7	1.0211	1.087
508	224.8	1.0214	1.087
509	226	1.0214	1.0869
510	227.1	1.0205	1.0865
511	228.2	1.0214	1.0868
512	229.4	1.0214	1.0867
513	230.5	1.0209	1.0866
514	231.7	1.02	1.0867
515	232.9	1.0218	1.087
516	234	1.0194	1.0867
517	235.2	1.0214	1.0868
518	236.4	1.0206	1.0871
519	237.6	1.0207	1.0869
520	238.8	1.0207	1.0868
521	240	1.0207	1.0865
522	241.2	1.0206	1.0867
523	242.4	1.0201	1.087
524	243.6	1.0213	1.0869
525	244.8	1.0217	1.087
526	246.1	1.0206	1.0868
527	247.3	1.0213	1.0869
528	248.5	1.0202	1.0868
529	249.8	1.0215	1.087
530	251	1.0213	1.0868
531	252.3	1.021	1.0865
532	253.6	1.0203	1.0867
533	254.8	1.0197	1.0866
534	256.1	1.0217	1.0867
535	257.4	1.0209	1.0867
536	258.7	1.0204	1.0868
537	260	1.0214	1.0866
538	261.3	1.0213	1.0865
539	262.6	1.021	1.0868
540	263.9	1.0198	1.0866
541	265.2	1.0213	1.087
542	266.5	1.0207	1.0869
543	267.9	1.0201	1.0867
544	269.2	1.0203	1.0866
545	270.5	1.0202	1.0869
546	271.9	1.0203	1.0868
547	273.2	1.0211	1.0871
548	274.6	1.0218	1.0869
549	276	1.0194	1.0868
550	277.4	1.0208	1.0869

551	278.7	1.0212	1.0869
552	280.1	1.0215	1.0871
553	281.5	1.0222	1.0872
554	282.9	1.0221	1.0871
555	284.3	1.021	1.0867
556	285.8	1.0196	1.0866
557	287.2	1.0215	1.0871
558	288.6	1.0209	1.0871
559	290	1.0205	1.087
560	291.5	1.0215	1.0871
561	292.9	1,0202	1.087
562	294.4	1.0217	1.0868
563	295.9	1.0207	1.087
564	297.3	1.0205	1.0866
565	298.8	1.0211	1.0869
566	300.3	1.0201	1.0866
567	301.8	1.0221	1.0871
568	303.3	1.0215	1.0867
569	304.8	1.0209	1.0868
570	306.3	1.0208	1.0871
571	307.8	1.0212	1.0871
572	309.4	1.0218	1.0867
573	310.9	1.0201	1.0864
574	312.4	1.0214	1.0871
575	314	1.0205	1.0866
576	315.6	1.0213	1.0867
577	317.1	1.02	1.0865
578	318.7	1.0203	1.0864
579	320.3	1.0212	1.0868
580	321.9	1.0202	1.0866
581	323.5	1.022	1.0869
582	325.1	1.0208	1.087
583	326.7	1.0215	1.0871
584	328.3	1.0205	1.0866
585	329.9	1.0214	1.0868
586	331.6	1.0197	1.0866
587	333.2	1.021	1.0862
588	334.8	1.0202	1.0865
589	336.5	1.0217	1.087
590	338.2	1.0205	1.0868
591	339.9	1.0204	1.0865
592	341.5	1.0211	1.0866
593	343.2	1.022	1.0872
594	344.9	1.0208	1.087

595	346.6	1.0192	1.0869
596	348.3	1.0216	1.0867
597	350.1	1.019	1.0863
598	351.8	1.0219	1.0869
599	353.5	1.0206	1.0866
600	355.3	1.0221	1.0871
601	357	1.0204	1.0865
602	358.8	1.0204	1.0868
603	360.6	1.0209	1.087
604	362.3	1.0219	1.0868
605	364.1	1.0226	1.0871
606	365.9	1.02	1.0865
607	367.8	1.0201	1.0864
608	369.6	1.0222	1.0871
609	371.4	1.0206	1.0866
610	373.2	1.0212	1.0869
611	375.1	1.019	1.0865
612	376.9	1.0225	1.087
613	378.8	1.0199	1.0863
614	380.7	1.0202	1.0868
615	382.6	1.0216	1.0867
616	384.4	1.0186	1.0867
617	386.3	1.0213	1.0868
618	388.2	1.0216	1.0868
619	390.2	1.0197	1.0866
620	392.1	1.0189	1.0861
621	394	1.0218	1.0863
622	396	1.0198	1.0864
623	397.9	1.019	1.0861
624	399.9	1.0192	1.086
625	401.9	1.0217	1.0867
626	403.8	1.0206	1.087
627	405.8	1.0212	1.0868
628	407.8	1.0208	1.0867
629	409.9	1.0216	1.0866
630	411.9	1.0215	1.0866
631	413.9	1.0215	1.0867
632	416	1.0229	1.0871
633	418	1.02	1.0865
634	420.1	1.0222	1.0868
635	422.1	1.0208	1.0863
636	424.2	1.0235	1.0874
637	426.3	1.0196	1.0864
638	428.4	1.0208	1.0868

639	430.6	1.0193	1.086
640	432.7	1.018	1.0859
641	434.8	1.0203	1.0866
642	437	1.0183	1.0862
643	439.1	1.0214	1.087
644	441.3	1.0232	1.0873
645	443.4	1.019	1.0865
646	445.6	1.0236	1.0874
647	447.8	1.0202	1.0868
648	450	1.0173	1.0859
649	452.2	1.0232	1.0873
650	454.5	1.0202	1.0866
651	456.7	1.0195	1.0867
652	459	1.0215	1.0867
653	461.2	1.0191	1.0864
654	463.5	1.0201	1.0866
655	465.8	1.022	1.0871
656	468.1	1.0218	1.0872
657	470.4	1.0157	1.0853
658	472.7	1.021	1.0869
659	475	1.023	1.0867
660	477.4	1.0217	1.0871
661	479.7	1.0204	1.0866
662	482.1	1.0249	1.0879
663	484.4	1.0197	1.0864
664	486.8	1.0227	1.087
665	489.2	1.0175	1.0861
666	491.6	1.0224	1.087
667	494	1.0218	1.0869
668	496.5	1.0236	1.0869
669	498.9	1.0189	1.0863
670	501.4	1.0183	1.0859
671	503.8	1.022	1.0872
672	506.3	1.0205	1.0863
673	508.8	1.0215	1.0869
674	511.3	1.0201	1.0863
675	513.8	1.0221	1.087
676	516.4	1.0223	1.0869
677	518.9	1.0228	1.0869
678	521.5	1.0209	1.0866
679	524	1.0238	1.0875
680	526.6	1.0224	1.0874
681	529.2	1.0194	1.0866
682	531.8	1.0199	1.0864

683	534.4	1.0208	1.0865
684	537.1	1.0216	1.0868
685	539.7	1.0182	1.0861
686	542.4	1.0207	1.0865
687	545	1.0192	1.0865
688	547.7	1.0208	1.0866
689	550.4	1.0212	1.0868
690	553.1	1.0212	1.0866
691	555.8	1.0218	1.0871
692	558.6	1.0217	1.0872
693	561.3	1.0217	1.087
694	564.1	1.0205	1.0865
695	566.8	1.0204	1.0865
696	569.6	1.0188	1.0862
697	572.4	1.0162	1.0857
698	575.2	1.0179	1.086
699	578.1	1.0234	1.0873
700	580.9	1.0212	1.0867
701	583.8	1.0217	1.0871
702	586.6	1.0202	1.087
703	589.5	1.0236	1.0872
704	592.4	1.0201	1.0867
705	595.3	1.0205	1.0869
706	598.3	1.022	1.087
707	601.2	1.0206	1.0866
708	604.2	1.0213	1.087
709	607.1	1.0197	1.0863
710	610.1	1.0204	1.0868
711	613.1	1.0214	1.0869
712	616.1	1.0203	1.0868
713	619.2	1.0187	1.0861
714	622.2	1.0188	1.0862
715	625.3	1.0173	1.0861
716	628.3	1.0193	1.0865
717	631.4	1.0216	1.0867
718	634.5	1.0203	1.0868
719	637.6	1.0174	1.0857
720	640.8	1.0188	1.0864
721	643.9	1.02	1.0865
722	647.1	1.0205	1.0867
723	650.3	1.0208	1.087
724	'653.5	1.0205	1.0864
725	656.7	1.0183	1.0861
726	659.9	1.0194	1.0865

727	663.2	1.02	1.0865
728	666.4	1.0198	1.0868
729	669.7	1.0209	1.0866
730	673	1.0206	1.087
731	676.3	1.0189	1.0864
732	679.7	1.0209	1.0867
733	683	1.0196	1.0864
734	686.3	1.0216	1.0865
735	689.7	1.0198	1.0867
736	693.1	1.019	1.0866
737	696.5	1.0189	1.0863
738	699.9	1.0187	1.0868
739	703.3	1.0175	1.0858
740	706.8	1.022	1.0867
741	710.3	1.0194	1.0865
742	713.8	1.016	1.0855
743	717.3	1.0156	1.0853
744	720.8	1.0197	1.0862