

1965

- PSCo History

HISTORY OF COMPANY STEAM SYSTEM

Year 1879 - Denver is a bustling town of almost 35,000; the utility business consisted solely of manufacturing coal gas and distributing it for use in street lights. On December 15, 1879 the Denver City Steam Heating Company was organized by John W. Smith, a bewhiskered pioneer who built the first flour mill in Colorado and Denver's first modern hotel, the American House, which was completed in 1869 on the corner of 16th and Blake Streets. Mr. Smith built a plant to supply steam to heat this hotel, some 6 blocks away at 19th and New Haven Streets. The location of the plant, just north of the present Union Depot, was probably chosen because the railroad was there and coal handling would be facilitated. Requests for steam heating services were made by owners of property adjacent to the steam main. The plant and distribution were expanded and soon steam heating service was being provided to the district bounded by 18th, Larimer, 15th and Wynkoop.

As the business section of the city grew, the steam system followed and during a period of construction around 1910, the system was enlarged to nearly its present area of service. Four different types of construction by the same number of companies working in different sections were employed to lay 8 inch mains on the lateral named streets. These were fed live steam by an 18 inch header originating at the present Denver Steam Heat Plant running up 19th Street to Wazee, then to 18th Street and up 18th to California Street. Here the main size was reduced to 10 inches and continued to Broadway. Although some laterals did extend for the header toward 20th, most of the system lay between 14th and 18th Streets.

With the consolidation of all gas, electric and steam heating operations in 1911, the Denver Gas and Electric Company became the operating company from which evolved our present company on August 2, 1923.

In 1920, we were serving 295 customers and the average use per customer was 906,000 lbs. per year or a total of 266 million lbs per year. In 1945, 25 years later,

we were serving 56 customers and the average use per customer was 1,375,000 lbs per year or a total yearly sale of 76 million lbs. The rate per M lbs was 73¢ and had just been raised with the avowed purpose of going out of the steam heat business.

We were losing money and operating at a loss in those years and had to do something to improve costs. A study was made and it was pointed out that we would have to pick up 69 customers and increase the yearly sales to 145 million lbs just to break even. Our only source of steam in 1945 was the old steam heat plant and steam costs were running about 75¢ per M lbs delivered to the customer. It was proposed that a tie line be built from the Zuni station to the system at a cost of \$125,000. Production and distribution costs would be greatly reduced utilizing an extraction type turbine where the steam fed to the steam heat system would be bled from two stages of a turbine, after it had completed its work producing kilowatts at the turbine blades.

In 1949, this tie line, 7832 feet of 14" and 16" pipe, was built, but costs had skyrocketed and instead of costing an estimated \$125,000, the bill was \$600,000. In addition to a tie line, however, a 14" header was installed on 14th Street from Curtis to Glenarm and a 14" main from 18th and Broadway to 17th and Court Place, down Court Place to 16th Street. Thus a grid system was created which has two sources of supply, the old standby steam heat plant which serves as a backup reserve and a most important supplier during maintenance periods at Zuni, the the Zuni Plant with its two bleed steam line, desuperheated steam supply.

Contrary to the predictions of our breaking even, the system began to show a small profit by the end of 1951, and by 1959 our revenue was more than $\frac{1}{2}$ million and we had close to \$100,000 net profit. That year we sold over 663 million lbs of steam to 155 customers, bringing the average use per customer to 3,280,000 lbs. This was about $3\frac{1}{2}$ times the average use figure in 1945 and total sales had risen almost 900% in this period.

In January of 1958 we made an agreement with the Denver U.S. National Bank to purchase peaking steam at the rate of 30,000 lbs/hr. In November, 1959, a similar contract was made with the Hilton Hotel to purchase some 60,000 lbs/hr. for peaking purposes. In November 1962, the Denver U.S. National Bank completed installation of a

40,000 lb/hr boiler for the sole purpose of furnishing steam to us when and if we would need it. In recent years, we have made good use of both these downtown sources, in fact we no longer look at them as peaking plants, but more as general steaming sources. The past year (1964) we purchased about 45 million lbs of steam from the Hilton and Denver U.S. National Bank at a cost of about \$49,000.00.

Our most recent venture in improving our capacity was the acquisition of the Colorado State Boiler Plant (14th & Sherman) in November, 1964, on a 30 year leasing agreement. At this time, we are realizing less than 15,000 lbs/hr from this plant, but we are in the process of adding additional burner capacity in the two existing boilers to bring the total output to 60,000 lbs/hr by the '65/'66 heating season.

We now serve 188 customers. We show a net gain of 26 customers in the past 10 years, installing 61 new services, but losing 35 customers. Most of these buildings were razed.

Sales, 1964-	- - - - -	874,305,000 lbs.
Sendout, 1964-	- - - - -	993,163,000 lbs.
: Total Revenue, 1964-	- - - - -	-\$686,700 (Hope to reach 1 million)
Net profit, 1964	- - - - -	-\$105,200

We have 11 air conditioning customers with a total of 16 Steam Absorption units ranging from 50 to 650 tons, totaling 5700 tons. This has greatly improved our summer load factor (60%) and is keeping us out of the red from May to October as was not the case prior to 1957 when our load factor was around 20% in summer months.

As to size of steam plants, we are listed 19th in the nation. Our maximum hour on the system occurred in March, 1965, when we delivered 354,000 lbs/hr. We have available capacity of 445,000 lbs/hr. As you can see by these two figures, we have plenty of steam to sell and we are more than willing to talk to anyone on steam.

Metering

In order to obtain some basis for charging for service, some type of metering is necessary.

Condensate Meters used for years - Meter condenses steam after passed thru Customer heating system and is collected at common point. This is an accurate and trouble free method.

Description of Operation - Weight of water causes center of gravity to change - Most of condensate goes to sewer and is lost. - Meter sizes from "B" size (500#/Hr.) to "G" size (12,000#/Hr.)

Flometers - Where it is impossible to collect all condensate to common point as where steam is used in a process where we cannot collect condensate or impractical to collect condensate Flow Meters are used. We now have 20 Shunt Flow Meters in use now and these measure steam as it enters the Building.

Description of Operation - Differential type with orifice, fan, shaft, Jewel bearing, and counter. Constant derived from calibration of the meter for the particular orifice and pressure corrections must be applied, to obtain proper results of steam flow.

Low Pressure steam, difficult to measure due to wide flow variations. These meters are fairly accurate above 20% capacity but need considerable maintenance and constant vigilance.

System capacity available - 445,000 #/Hr.
Maximum Hour on System - 354,000 #/Hr., March 1965.
Maximum Hour on TieLine - 280,000 #/Hr., January 1961.

System has notoriously low load factor. - *32.7% AVG. IN 1964*

L.F. = Sendout - 60% in a warm summer month - to about 44% in
Max.Hr.x No. Hrs.

a cold winter month.

Because of these conditions it is unwise to sign up additionalth customers whose load conditions would not tend to improve the L.F.

Steam Applications

Space Heating
Hot water heating
Down spout thawing in winter
Humidification in printing Plants (Denver Post) - keeps paper from becoming brittle.
Ink Drying in Printing Plants (Rotogravure Print)
Fire protection and Steam Tables in Restaurants
Humidifiers in computer rooms. Keeps tape flexible and correct length.
Steam injection for Dishwashers, Bakery Proof Boxes and Oven Humidification
Absorption Air Conditioning - We have eleven (11) Air Cond. Customers with a total of (16) Steam Absorption units ranging from 50 to 650 tons totalling 5,700 tons. This has greatly improved our summer load factor and is keeping us out of the red from May to October as was not the case prior to 1957 when our load factor was around 20% in summer months.

Absorbtion System Refrig. Machines take advantage of certain physical properties of absorbant solutions uner controlled pressure conditions, to extract heat. Coolers, Heat Exchangers, absorbers, Generators, Condensers, Eductors and pumps make up most of the equipment for such a refrigerating. cycle.

Low pressure steam is used as a source of heat in the Generator to vaporize water and concentrate the absorbant solution for re-entry into the cycle. Water is the medium cooled by this process for use in Air. Conditioning.

It is claimed by Mfgs. that operating cost such (of) a Unit runs about 15% below that of a compressor type Refrig. unit of same output. Absorbtion unit is quiet, non-vibrating. Can be placed on Roof tops and other Low capitolized space.

Although there appears to be some variation of opinion as to the quantity of steam required to air condition or cool a given space it seems to run up to $1\frac{1}{2}$ times the amount of steam to heat the same space. Type of Building characteristics of the Business, amount of lighting load all influence the job to be done.

1965
Customers We serve 188 Customers involving Office Buildings, like P. S. Co. Bldg., Banks, Churches, Hotels, Theatres, Restaurants, etc.

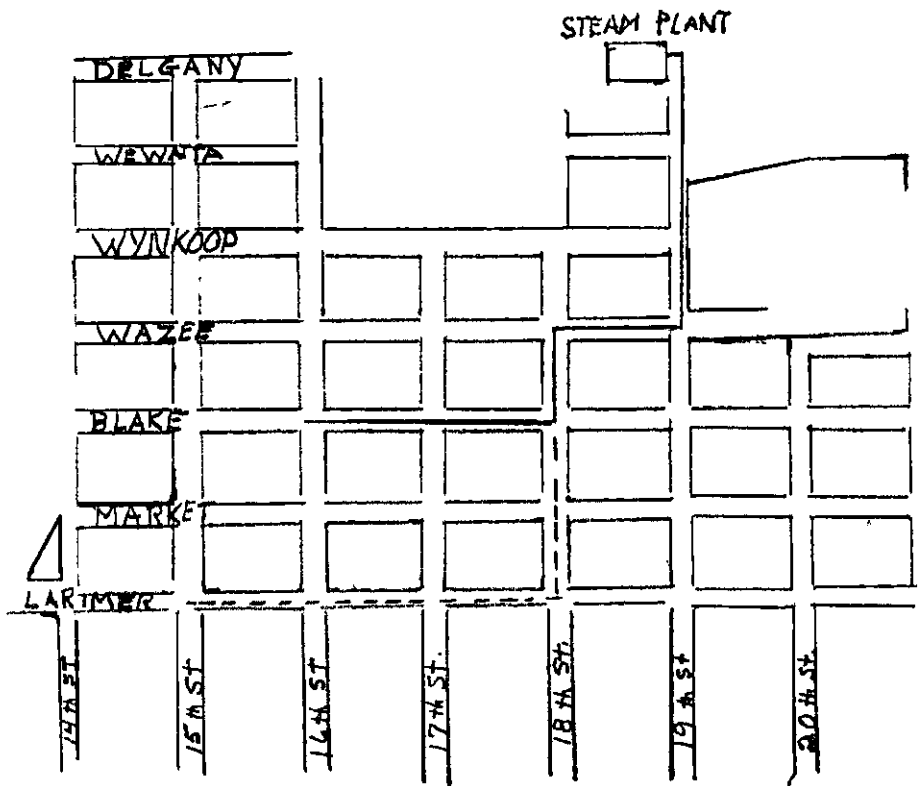
Customer Complaints and Troubles - ^{IN} ~~Customer systems are:~~ Customer systems are:
No Heat - Traps plugged, or valves closed, Motorized valves sticking or Thermostats not operating properly. ALSO PRESS. REDUCING VALVES STICKING.

Leaks - Valves found leaking or meter steaming or sweating, or trap leakage.

High and Low Consumption.

New Services - We show a net gain of 26 Customers in the past 10 years. In stalling 61 new services but losing 35 customers. Most of these buildings were razed.

Main Work - Replacement - Rust as result of underground water settling around our Mains and Services.



DENVER STEAM HEATING SYSTEM

————— 1879
 - - - - - 1900's + 1890's