Industry Speaks

Why We Want Atomic Power

Adapted from remarks by Gordon Dean, Immediate Past Chairman, United States Atomic Energy Commission, before the Annual Meeting of the Edison Electric Institute.

WE want atomic power because there is a demand for it. We know ~~this~~ because of the intense interest demonstrated by so many industries and businesses ~~in~~ it. One might conclude that if there ~~is a~~ demand for atomic power, it must be ~~worth~~ going after.

But this is hardly a national policy reason for pushing toward the early development of an atomic power industry in this country. A good national policy reason would be provided, of course, if we were on the verge of running out of coal, oil or gas in a year or two. But we *are not*. This may be true of others, but it is not true of the United States.

Why, then, do we want atomic power? I think we want atomic power because as soon as it comes into being it will reduce the rate at which we are using up our other natural resources. It will release them for other uses or permit us to conserve them for future specialized use.

We want atomic power because our demand for energy in this country and in the world is increasing at an enormous rate, and the costs of producing such fuels as oil and gas will ~~steadily rise as~~ the supplies dwindle. ~~We will~~ need a supplementary source ~~of energy~~, and to be ready when the time comes we must push ahead now.

We need atomic power because atomic fuels are virtually weightless fuels. They can be taken anywhere in the world—to the source of the raw materials upon which industries are based—to deserts, to mountains, and to islands.

We need atomic power so that we may help our friends in the world who are in need of new sources of power. I have particularly in mind those who have been and are supplying us with the uranium with which we are feeding our weapons program.

And I think we need atomic power because no one really knows the enormous impact this new source of energy may have on our economy and our mode of life. I have heard that there were ~~people~~ who asked Henry Ford, "~~Why do we~~ need the automobile when we can get where we're going quicker on a horse?"

Right now our objective is to advance our atomic power technology to the point where it can compete with the "horse" that is coal, gas and oil. But that is just the beginning. I know, and I think we all know that there is more in the atom than that.

Ten Points for Advancement

Adapted from remarks by Dan. J. Haughton, vice president and general manager of the Georgia Division, Lockheed Aircraft Corporation, Marietta, Georgia, before the graduates of the Southern Technical Institute.

THE industrial road to success is, of course, a two way street. But from industry's standpoint the following are ten points for advancement:

1. Industry respects the graduate who seeks and obtains his job on his own, with only the aid of the placement bureau of his school, and without the help of influential friends and family. This gives the newcomer more confidence and industry feels more confident of the newcomer.

2. Industry expects absolute integrity and honesty, regardless of circumstances. This quality must be a part of a man's character.

3. Drive and enthusiasm are essential. This means thinking of work as a pleasure and the realization of an ambition. No one should stay on a job for a long period of time if he cannot work it into a challenge. The newcomer should do more than is asked and more than is expected.

4. Dependability. This starts the first day at work and it means being on the job before the prescribed time and staying on the job throughout the working day. A company can be no more dependable than its people.

5. A man should have loyalty to his company and to the individual employee both on and off the job. Lack of loyalty hurts the company and its supervision, but most of all it hurts the individual.

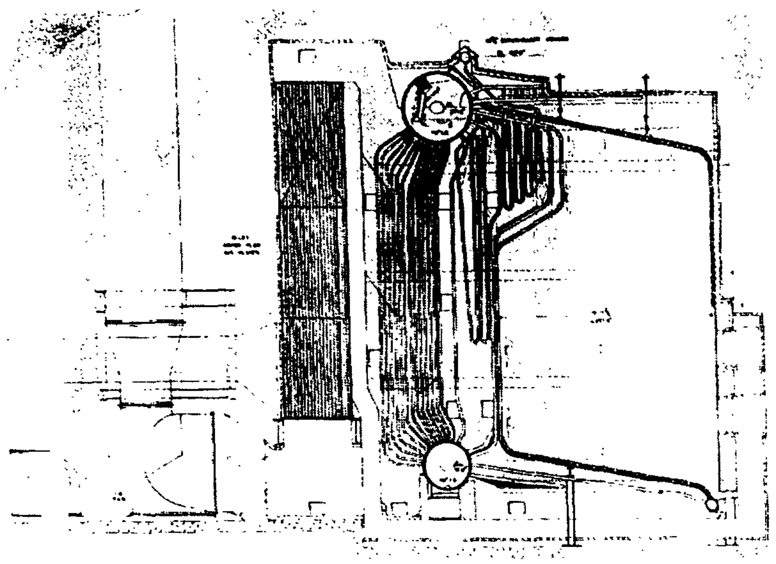
6. An open mind that is willing to continue learning. Men with more experience will eagerly help the man who honestly wants to learn. Ideas come from below as well as from up top.

7. Humility is a great asset. To me the greatest sales point of human character is humility, and the larger the job you advance to, the more important humility becomes. Progress will come faster to those who practice humility from the start. And humility does not mean letting someone walk over you.

8. Keep an even disposition. Criticism will have to be accepted at times, as well as praise. If the boss did not think you were susceptible to help, he would dispense with your services.

9. Be kind and be just a "plain human being."

10. And, finally, fulfill your obligations to your God, your country, your family, and to your community. The activities other than your work will give you a source from which to draw strength when you need it.



Section of the Riley 250,000 lb/hr, 650 psi, 750 F steam temperature boiler.

psi. The lower pressure steam is used to drive prime movers and for processing. A 16 in. header connects the 650 psi steam systems of the new and existing boiler plants.

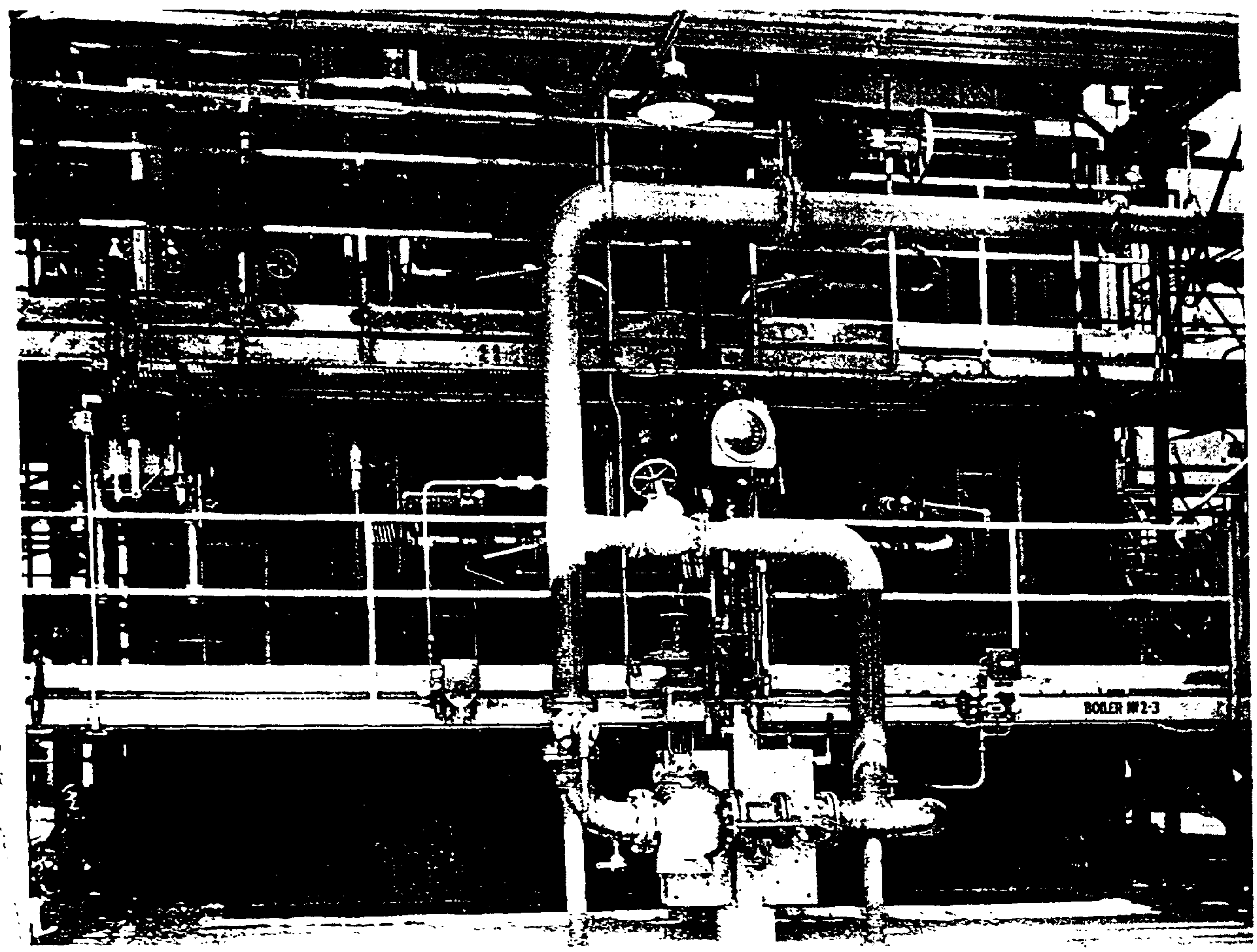
The new plant is of outdoor design. The only sheltered locations are two brick, air conditioned buildings that house the controls for the boilers and water treating plant.

Arrangement of the equipment now installed and design of the control rooms are such that further expansion can be carried out with minimum amount of interference with operations. Two-way radio communication is available between the two boiler plants as well as telephone. Both plants have inter-com systems that can also operate over the two-way radio. Since the two plants are physically connected with each other as well as to processing plants by the 650 psi steam system, close liaison is necessary.

Steam Generators

The boilers are Riley 250,000 lb/hr, 650 psi two-drum units with forced and induced draft. Each is equipped with Riley high velocity superheaters producing a final steam temperature of 750 F. The distribution of heating surface is as follows: boiler, 16,985 sq ft; superheater, 4800 sq ft; water walls, 7530 sq ft.

The Riley Stoker Corporation boiler is entirely of outdoor design. Fuel gas regulating valve and burners are accessible from ground level and two platforms, respectively



ɼated, a light gas oil is used rather than the conventional grade of fuel oil. This eliminates the need for oil heating facilities and provides a standby source of fuel that presents few handling or firing problems.

Draft Fans

Combustion air is supplied by a forced draft fan of 375,000 lb/hr capacity. The drive is a 273 hp turbine fitted for speed control. Air temperature is raised from 80 F to 450 F by a Riley tubular, single pass, cross-flow preheater with 25,000 sq ft of heating surface. Combustion gases are removed from the furnace by an induced draft fan of 400,000 lb/hr capacity. The drive is a 276 hp turbine similar to that used on the forced draft fan. Each boiler has a 7 ft diameter, 75 ft high (above ground) stack to receive the discharge from the induced draft fan.

Feedwater Pumps

Feedwater is supplied to the boilers at 250 F by three four-stage, 638 gpm, 1875 ft TDH pumps. Two are driven by 450 hp turbines and one by a 2300v, 450 hp motor. One of the three pumps is used as a spare.

Miniature Indicators and Control Units

All boiler controls, pressure indicators and steam flow meters are in a central, air conditioned control room located at ground level. Pressurized piping has been eliminated from the control room by the use of pneumatic transmitters on all measured factors of flow, pressure, level, draft and speed. Boiler meters, feedwater control and combustion control were furnished by the Bailey Meter Company. Recording instruments are mounted on a vertical panel. All Bailey Mini-Line indicating and control instruments are mounted on a sectionalized console located in front of the recorder panel.

The flow transmitters for the boiler are of the square root extracting type so that air pressures developed by the pneumatic transmitters vary directly with changes in rates of flow. All transmitters are mounted as close to the point of measurement as is consistent with accessibility from the standpoint of maintenance.

The primary focus of the operators attention is the sectionalized control console which provides an inclined control panel at approximately desk height, with a nearly vertical indicator panel sloping upward from the control panel. One console section is provided for each boiler. On the central, master control section, indicators and control are on the nearly vertical panel in order to provide a desk area for the operator.

The Mini-Line indicators are vertical scale type pneumatic receivers and are so grouped that the "pointer pattern" is made use of to facilitate scanning by the operators. The control panels of the boiler consoles include the necessary remote manual-automatic selector valves, selector switches and remote manual loading stations. A typical selector valve operation is described.

The Bailey combustion control system functions in the following manner. The 650 psi steam header pressure actuates the master steam pressure controller which, in turn, controls the fuel simultaneously on each boiler. The induced draft on each boiler is controlled in parallel with the fuel but is readjusted by

Forced and induced draft fans are driven by speed controlled turbines.

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may be operated by manual-automatic selector valves. These selector valves also permit adjustment of the control point while in automatic operation.

Air for the operation of all pneumatic instruments is supplied by a horizontal 7 in. by 5 in. reciprocating compressor with a capacity of 75 cfm at 50 psi. The drive for the compressor is a 15 hp, 440 volt motor. After being compressed, the air is first passed through an aftercooler, accumulator and an air dryer before being distributed to the instruments. The air dryer has a capacity of 150 cfm and uses silica gel as a drying medium. Regeneration is automatic and operates on a four-hour cycle.

Pressure control on the instrument air system is automatic. High pressure (120 psi) plant air, with an automatic pressure reducing valve, provides a source of standby air for use when the instrument air compressor is being serviced or in the event of power failure.

All signals indicating abnormal operation are both visual and audible. The visual signal alarms are concentrated in an easily read block of lettered panels.

Also on automatic control is a high capacity 650 psi to 200 psi pressure reducing and desuperheating station. The purpose of this station is to meet demands for 200 psi process steam in the event that the flow from the exhaust of the 650 psi turbines is not sufficient.

Feedwater Treatment

Since it was necessary to operate this boiler plant on 100 per cent treated makeup, extensive water treating facilities were required. Experience at the other boiler plant had indicated that steam turbine fouling could be expected even though the total dissolved solids in the steam were 1 ppm or under. To avoid interruption of processing operations by water washing 650 psi steam turbines and keep the steam consumption of process turbines in general to a minimum, it was necessary to solve the problem of steam fouling. This was done by choosing the deionizing and silica removal process for feedwater treatment.

The untreated water is supplied by deep wells that discharge directly into the deionization plant. The chemical composition of the water is practically constant and

PRINCIPAL EQUIPMENT—Shell Oil Company, Houston Refinery, No. 2 Steam Generating Plant

BOILERS AND EQUIPMENT

Boilers ....Two — Riley Stoker Corporation, 2 drum, outdoor, 650 psi, 750 F final steam temperature, gas fired 250,000 lb/hr each. Steam drums 72 in. x 27 ft 3 in. x 3 3/8 in. Mud drums 48 in. x 26 ft 9 in. x 2 11/32 in.

Superheaters ....Riley high velocity type, 4800 sq ft heating surface.

Furnaces ....Riley water wall, 7,530 sq ft heating surface 22 ft 9 in. wide, 19 ft 11 in. deep, 29 ft 6 in. high. Volume—12,700 cu ft.

Air Heater ....Riley, vertical tubular, single pass crossflow 25,000 sq ft heating surface, 80 F inlet, 450 F outlet.

Water Columns ....Two per boiler; water gage with 12 1/2 in. vertical visibility.

Speed Controls, FD and ID Fans Four — Combination mechanical-pneumatic.

Forced Draft Fans and Drives Two—375,000 lb/hr air; driven by 273 hp gear connected steam turbines.

Induced Draft Fans ......Two—400,000 lb/hr flue gas; driven by 276 hp gear connected steam turbines.

Feedwater Control Valves.....Two—Diaphragm actuated, air operated.

Fuel Gas Header Pressure Control Valve ....Two—Diaphragm actuated, air operated.

Pressure Reducing Station Control Valve ....650 to 200 psi, 500,000 lb hr capacity, diaphragm actuated, air operated.

Water to Desuperheater Control Valve ....One—diaphragm actuated air operated

Desuperheater ....500,000 lb hr capacity, Venturi type

Desuperheater Steam-Tem. Controller ....Pneumatic transmitter type

Blow-off Valves ....Two mud drum and three water wall per boiler, 1 1/2 in. unit-tandem type

Boiler Blow-off Tank ......One—vertical 10 ft 6 in. x 72 in.

FUEL SYSTEM

Burners ....Four per boiler. Combination gas and oil. Oil is steam atomized

Combustion Control ....Bailey pneumatic

Fuel Oil Pumps ....Two—Centrifugal 200 gpm [illegible] TDH pumps driven by 40 hp steam turbines.

Fuel Oil Storage ....One—25 ft diameter, 30 ft high, closed storage tank equipped with automatic indicating level gage.

Fuel Oil Pressure Control and Control Valve ....Two—Controlling steam to fuel oil pumps. Diaphragm actuated, air operated.

Fuel Oil Flow Control Valves..Two—Diaphragm, actuated, air operated.

BOILER FEEDWATER EQUIPMENT

Feedwater Pumps ....Three—4 stage, horizontal centrifugal pumps, 638 gpm, 1875 TDH. Two steam turbine driven, 450 hp. One motor driven 2300 volt, 450 hp.

Deaerating Feedwater Heater. 695,000 lb/hr capacity, 15 psi, spray type with scrubber section and internal vent condenser. Permutit Company.

Deionizing Water Treating Plant ....Permutit Company—1600 gpm capacity, 8 ion exchange units with regenerant measuring and dilution tanks and degasifier.

Deaerating Heater — Feed Pumps ....Three—800 gpm, 150 ft TDH, bronze case and impellers. Two steam turbine driven by 45 hp type R3R turbines. One motor driven by a 40 hp 440 volt motor.

Anion Exchanger—Feed Pumps Two—2000 gpm, 144 ft TDH, Durimet 20 case and impeller. One steam turbine driven by a 95 hp turbine. One motor driven by a 100 hp, 2300 volt motor.

Chemical Transfer Pumps....Two—50 per cent caustic pumps, 20 gpm 35 ft TDH. Driven by 1 hp 440 volt motors. Two 93 per cent sulfuric acid pumps, 10 gpm, 35 ft TDH, driven by 2 hp, 440 volt motors.

Chemical Injection Pumps ...Three—Sodium sulfite and phosphate injection with a common spare 1/2 gph capacity.

Treated Water Storage Tank. One—420,000 gallon capacity, vertical steel covered tank.

Treated Water Conductivity Recorder ....4-point strip chart recorder. Operates from four conductivity cells.

MISCELLANEOUS EQUIPMENT

Water and Steam Flow Meters. Thirteen—Pneumatic transmitter type (d/p cell) integrating and recording

Pressure Gages ....Pneumatic transmitter type.

Electric Substation ....One—2300 [illegible] volt, 300 kva transformer; 2300 volt switch gear [illegible] 440 volt switch gear.

Sump Pump ....One—120 gpm, 50 ft TDH vertical; driven by 3 hp, 1800 rpm 440 [illegible]

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from the exhaust of turbines in processing plants.

All partially treated and treated water piping ahead of the deaerating feedwater heater is internally coated to provide protection against corrosion or water contamination. The acid effluent of the cation exchangers is passed through rubber lined pipe and pumped by pumps constructed of a corrosion resistant alloy. The interconnecting piping from the anion exchangers, storage tank, deaerator charge pumps and to the deaerating heater is lined with a baked phenolic resin. The storage tank itself is internally coated with a hot applied bitumastic coating, while the deaerator charge pumps are constructed of bronze.

As an additional precaution against scale and corrosion, phosphate and sodium sulfite are injected into the treated water following deaeration. Small mixing tanks and three chemical injection pumps are used for this purpose.

Since each exchanger has a treating capacity of a fixed number of gallons, before requiring regeneration, metering of the water constitutes an important control. Pneumatic transmitter type meters which both record and integrate flow supply this control. The integrator on each meter operates a totalizing counter which in turn sounds an alarm when sufficient water has passed through an ion exchanger to exhaust its treating capacity. A four-point conductivity recorder provides a continuous check on the quality of the effluent of each anion exchanger.

All signals and measured pressures or flows are either electrically or pneumatically transmitted to a panel in an air conditioned control building. This building also contains the laboratory equipment required for performing such tests as are necessary to control the feedwater and boiler water treatment.

The chemicals used for regeneration of the ion exchangers are dilute sulfuric acid and dilute sodium hydroxide for the cation and anion exchangers respectively. These chemicals are received and stored as 50 per cent sodium hydroxide and 93 per cent sulfuric acid. The amounts required for a regeneration are prepared in mixing and dilution tanks.

Regeneration of an ion exchanger is a semi-automatic process, controlled by a motor operated multiport valve. When a unit requires regeneration as determined by a meter actuated alarm signal, or by chemical test, regeneration is initiated from the control room by pressing a switch that starts the multiport valve on the desired unit. The regeneration then goes through a complete cycle automatically and returns the unit to service. A regeneration cycle consists of backwash, regeneration (during which period the regenerant chemical is hydraulically inducted into the exchanger) and rinse. The rate of flow of water from the unit to waste during backwash and rinse is controlled by float actuated butterfly valves so adjusted as to hold a fixed head of water over an orifice board type weir. The multiport valves have pilot connections which hydraulically actuate diaphragm valves to determine which exchanger receives the regenerant chemical.

Ion exchangers are arranged in two banks of four each. Regeneration of an ion exchanger is a semi-automatic process, controlled by a motor operated multiport valve.

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