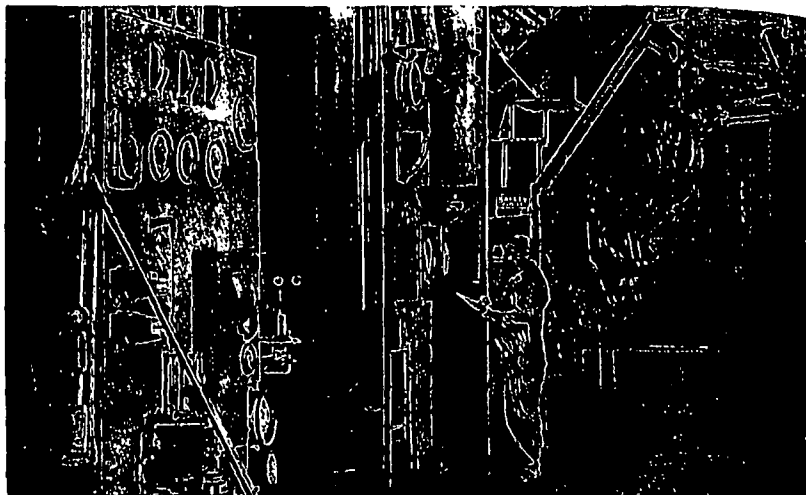




STOKER INSTALLATIONS such as the one pictured above require careful start-up procedure if they are to perform efficiently

## Planned Start-Ups Prolong Stoker Life

- Expansion stresses and strains in metal parts of stoker equipment reach maximum during rapid temperature changes from shutdown to on-the-line conditions
- Operator hazards resulting from equipment failures or preparation oversights are most likely to occur during start-up
- Definite advantages of shorter start-up periods can come only when operator follows carefully detailed lighting-up procedures

► THE START-UP PERIOD is probably the most critical for any boiler equipment and it is at this time that potential hazards to operators are greatest. On the opposite page is a set of detailed instructions that, if followed carefully, can be a major factor in completely eliminating accidents during this operation.

This procedure shows how an industrial power plant burning one-third million tons of coal annually on underfeed and chain grate stokers outlines precautions taken to assure that units are properly prepared for use.

The units that supplied the data for this discussion were: (1) 8-retort underfeed stokers equipped with Stirling boilers of 55,000-lb per hr steaming capacity at 225 psi and 500° F, and (2) chain grate stokers with 70,000 lb per hr boilers operating at 275 psi and 550° F. Actual operator's written start-up procedure records combined with equipment manufacturer's check sheets form the backbone of this material.

Although the steps outlined here are admittedly very detailed, experience has shown that added care at this point of boiler operation materially increases efficiency and adds to the life span of boiler equipment.

Material for this article was adapted from *Lighting Off and Starting Up Procedures for Stoker Fired Boilers*, a paper by Herbert W. Andrews, Asst. Steam Dept. Head, Power Division of Eastman Kodak Co., presented at the Fall Meeting of the American Society of Mechanical Engineers.

## UNDERFEED STOKER Recommendations

**STEAM SYSTEM:** Open all superheater header drains and automatic stop and check valve. Check steam line between boiler stop valve and automatic stop and check by opening drain valve at boiler stop valve. When line is dry, start bringing it up to pressure and temperature slowly with bypass valve open around boiler stop valve. When line is up to pressure, open boiler stop valve and close bypass valves.

**LAYING THE FIRE:** Set stoker secondary ram control in third notch (first notch—zero motion), set stroke adjusting valves for zero motion, start stoker-drive equipment, fill hopper, start stoker and run coal onto grates until secondary rams are covered to approximately half their length.

Uniformly distribute eight gal. of petroleum fuel igniter (diesel engine oil jellied with aluminum soap) on coal in grates near front wall. Smear one side of wooden sticks with igniter and place to bridge ponds of igniter. This will act as a fuse.

If fuel igniter is not available, pile wood one ft deep and two ft wide adjacent to front wall. Pour kerosene on pile and use this for igniter.

**AIR SYSTEM:** Close ash gates, sifting hopper gates, windbox access door, furnace doors, damper, front-wall and side-wall secondary air dampers. Open rear (stack) damper to minimum position on regulator. Place forced draft regulator in service to maintain automatically 0.1-in. furnace draft.

## CHAIN GRATE STOKER Procedure

**STEAM SYSTEM:** Open all superheater header drains and automatic stop and check valve. Check steam line between header stop valve and automatic stop by opening drain at header stop valve and venting at automatic stop and check valve. When line is dry, bring up to pressure with bypass so header stop valve. When line is up to pressure, open header stop valve and close bypass valve.

**LAYING THE FIRE:** Carefully raise regulating gate to at least 12 in. Drop feed plates and frames to lower position. Spread 6 to 8-in. layer of coal under ignition arch and over No. 1 compartment. Just beyond the feed plates, make a shallow trough in the coal running entire width of grate. Uniformly distribute four gal (5 gal for No. 7) petroleum fuel igniter in this trough.

Petroleum fuel igniter is non-toxic and usually harmless to skin. As with kerosene, store igniter in covered container away from excessive heat. If fuel igniter is not available, use wood and kerosene as a substitute in the same manner as described above.

**AIR SYSTEM:** Close all setting access and inspection doors and ash gates. Close all stoker air compartment dampers. Open rear (stack) damper tight-closing device, then clamp damper about 1/2-open on regulator. Open windbox damper about half way and clamp.

**RAISING PRESSURE:** Remember, to establish good ignition at front wall, slowly cover grates with fuel and obtain and maintain straight open burning lanes over tuyeres. To prevent damage, allow two hours from lighting time until unit goes on line.

Light igniter with torch through both front wall doors. When coal is ignited completely across front wall (approximately five minutes after lighting), start stoker at minimum speed in low gear. Lengthen secondary ram stroke as much as possible without losing ignition at front wall. Increase opening of rear damper as much as possible without effecting capacity of remaining units in service.

When pressure reaches 25 psi, throttle inlet superheater header drain to one turn open. When pressure reaches 100 psi, blow down feedwater regulator and blow down water column. As active fuel bed moves onto grate, apply normal stroke of 3-in. agitation, 2-in. push.

Stoker may be stopped to regain ignition at front wall, but to avoid damage, it should run at least one revolution every ten minutes.

**AFTER GOING ON LINE:** When boiler is on line, close superheater header drain valves. Manually lift all safety valves (four 3 1/2-in. valves on boiler and one 2-in. valve on superheater). Enter record of boiler, valves and date in Equipment Record Book, use separate page for each unit. Place feedwater regulator, phosphate feed and continuous blowdown systems in service. Open impulse connection from steam drum to feedwater pump governors.

**RAISING PRESSURE:** Light fuel igniter with torch. When coal adjacent to igniter is burning, slowly open No. 1 air compartment damper and adjust to maintain furnace draft of -0.1-in. water. Lower coal gate to about 8 in., raise feed plate frames and secure with pins. Run stoker at minimum speed and add fuel. But don't fill hopper until entire bed is burning briskly and ignition arch is hot.

Open coal bunker grates and latch up coal spout awingers. When fuel bed reaches second compartment, gradually open its damper and readjust No. 1 and stack dampers to maintain furnace draft as above. It should not be necessary to break up fuel bed with bar at any time. Turn on cooling water on rear stoker roll.

If wood is used for ignition, follow same procedure, but allow more time for ignition and spread additional coal on top of briskly burning wood.

At 25-psi pressure, close inlet superheater header drains. At 150-psi pressure, blow impulse lines to feedwater regulator and water column.

**AFTER GOING ON LINE:** When boiler is on line, close outlet superheater header drain, place furnace draft controller in service, adjust stack damper to suit load, open continuous blowdown valves, start secondary air fan and place feedwater regulator in service. Manually lift all safety valves. Enter record of boiler, valves and date in Equipment Record Book. Use separate page for each unit and sign each entry.