Courses boost employe morale because each man knows the plant, and so takes more pride in his work

By STEVE ELONKA, *Associate Editor*



TRACING each important piping system with red pencil over simplified print is one of the most important teaching devices. Trainees get to know plant quickly

► LAST NOVEMBER, the new 100,000-kw unit of Glenwood Station, Long Island Lighting Co, Glenwood Landing, Long Island, went into operation without a hitch. Answer is a training program that prepared employes for new duties.

One reason for the program's success is Maxwell Marshall, chief engineer of the plant. His background of preparing lesson plans, teaching classes, at U.S. Merchant Marine Academy during the war, was a big help. Max was so sold on organized lesson plans he was given a large share of seeing training project through. Fact is, it's been tagged "The Marshall Plan" throughout the plant.

Program cost $25,000, but the company feels it is well worth the money. Marshall wrote construction and operation of turbines, boilers, auxiliaries. Electrical course was written by Charles Robbins and Charles Chase. Anthony Tamburrino prepared instrumentation, feedwater treatment.

New Plant. To understand the problem of training present operating and maintenance personnel for the new plant, let's take a look at some equipment and machinery involved.

New reheat boiler has primary output of 750,000 lb per hr at 1525 psi, 1005 F. Reheat steam of 665,000 lb per hr is reheated to 1005 F. Boiler burns coal, oil or natural gas, is semi-outdoor type. Superheat is controlled by bypass damper, and reheat by tilting burners. Oil burners are elevated above coal and gas burners to maintain superheat.

Turbine is tandem-compound, 3-cylinder, 90,000- to 99,000-kw. It has 22 stages and 27 wheels, five extraction points, and is the first outdoor turbine in the Northeast. Entire plant operation is from a central control room.

In the old plant, turbine and boiler operation is local. That plant has six boilers with 2,150,000-lb-per-hr total output at 410 psi, 750 F. Three turbines have total output of 198,000 kw. They are straight-through, single-shell type, with three extraction points.

Six boilers feed steam to common header, which, in turn, supplies steam to turbines. Condensate from turbines passes through stage heaters, then discharges into common feedwater header. These unit-to-unit interconnections can complicate operation.

New plant is first step in a $50,000,000 program, to double firm's electric-generating capacity by 1954. A duplicate unit will go into operation in Far Rockaway this year, and a third at Glenwood Landing, in 1954.

Training Program. Twenty-six operating personnel in plant took this 43-week course, although only 16 men had been selected competitively for the new station; 26 started and 25 finished. The one- to two-hour lectures depended on time needed to put lesson over.

Lessons were scheduled from 8-9 am and 4-5 pm, three days per week, with overtime pay for all attending. Average attendance was 88.9%, which is very high, considering vacations and normal absences. Fact is, many men went during vacations.

All operators were accepted for the course without examinations. Six one-hour exams were given during course; average mark of 82.5% shows that lessons were well-learned.

Chart on opposite page shows how subjects were broken down into lessons. Simple diagrams showing details were blueprinted and every student was given a set. Each man traced out each system by coloring his drawing as he went along. By the time he had traced it, he had located every piece of equipment in that system. This is a great help, for every operator has actually seen each piece of equipment and knows where it is.

Costs. Time to prepare class material—research; writing class notes; drawings in textbooks, on blackboards; typing; mimeographing; etc—came to 3590 man-hours. Overtime, chargeable to class attendance, cost $12,000; paper photostats, etc, $670. Cost per student, including supervisory labor, averages about $1000.

Long Island Lighting Co is so well pleased that it is repeating the course for the new Far Rockaway plant.

Not only is each operator better fitted for his job, but these courses have also improved employe morale. As Max Marshall modestly said, "There is nothing to acquaint key men with a new plant like working out lesson plans. By time he gets through assembling the information so it can be taught, instructor learns more than the trainees.

THIS COURSE is wide enough in scope to cover operation and maintenance of all the important equipment in the new plant

Preliminary Training Program for Station No. 3

First Half of Plan by Weeks

	Second Period	Third Period
PRINCIPLES OF HEAT	1. Steam and its properties	1. Simplified steam table
BOILER OPERATING FUNDAMENTALS	1. Factors influencing evaporation circulation	1. Warming up a boiler
BOILER NO. 10	1. General construction	1. Superheaters a. Primary & secondary b. Reheater 2. Superheat control
BOILER NO. 10	1. Economizer	1. Steam-drum internals
BOILER NO. 10	1. Air-heater construction, operating precautions	1. Safety valves' construction, location
BOILER NO. 10 AUXILIARIES	1. F-d fans a. Ductwork b. PA system	1. Cyclones and precipitators
BOILER NO. 10 AUXILIARIES	1. Coal-preparation mills	1. Combustion fundamentals
BOILER NO. 10 AUXILIARIES	1. Gas burners a. System b. Supervisory control	1. Oil burners a. System b. Supervisory control
BOILER NO. 10 AUTOMATIC CONTROLS	1. I-d fan – furnace pressure controls	1. F-d fan controls a. Measurement points
BOILER NO. 10 AUTOMATIC CONTROLS	1. Bailey FW control system	1. Report writing
BASIC FEEDWATER TREATMENT	1. Chemicals	1. Special considerations a. Economizer
TURBINE NO. 1	1. Construction a. Blade points	1. Governor principles
TURBINE NO. 1	1. Starting and safety devices	1. Safety and trip devices a. Throttle valve
TURBINE NO. 1	1. Lubricating system a. Piping b. Coolers c. Purification d. Storage	1. Condenser – construction and operation
TURBINE NO. 1 AUXILIARIES	1. Circulators a. Construction b. Capacity c. Priming	1. Condensate pumps a. Construction b. Capacity
TURBINE NO. 1 AUXILIARIES	1. Boiler feed pumps a. Construction b. Control c. Operating precautions	
TURBINE NO. 1 GENERATOR	1. Hydrogen cooling	1. Hydrogen sealing a. Gas control b. Hydrogen panels	1. Preliminary electrical examination
BASIC ELECTRICITY	1. Definitions	1. Simple circuits	1. Magnetism and induced voltage
BASIC ELECTRICITY	1. Ac generators a. Construction	1. Ac theory a. Quantities	1. Ac theory a. Sine waves b. Power factor
ALTERNATING CURRENT	1. Polyphase circuits	1. Ac generators	1. Transformers and circuit breakers

Second Half of Plan by Weeks

Week	First Period	Second Period	Third Period
1st	ELECTRICITY 1. Makers' nameplate data	1. Oil circuit breakers	1. Examination
2nd	ELECTRICITY 1. Wiring diagrams	1. Station control	1. Main control board
3rd	BOILER NO. 10 1. General review a. Construction b. Circulation	1. General review a. Auxiliaries	1. Main control board a. Boiler section
4th	BOILER NO. 10 AUXILIARIES 1. Main control board a. Instruments I	1. Main control board a. Instruments II	1. Coal-burning system and controls
5th	BOILER NO. 10 AUXILIARIES 1. Post-oil-burning system and controls	1. Gas-burning system and controls	1. I-d fans 2. F-d fans 3. Air preheaters
6th	BOILER NO. 10 AUXILIARIES 1. Superheat, reheat and heat controls	1. Flying-circle exhibits	No class
7th	BOILER NO. 10 AUXILIARIES 1. Ash-handling system and controls	1. Soot-blowing system and controls	1. Chemical feed, blowdown systems; controls
8th	BOILER NO. 10 1. Interlock protection system	1. Starting-up procedure	1. Banking, normal-time-service procedures
9th	BOILER NO. 10 1. Banking-out procedure	1. Report writing, log	No class
10th	TURBINE NO. 1 Examination	1. General review a. Construction b. Steam flow	No class
11th	TURBINE NO. 1 1. General review a. Main governor	1. General review a. Pre-emerging gov. stop valves, safety trips	No class
12th	TURBINE NO. 1 1. Lube-oil system	1. Main control board a. Turbine controls	No class
13th	TURBINE NO. 1 AUXILIARY SYSTEMS 1. Circulating-water system and controls	1. Condensate storage and transfer system	No class
14th	TURBINE NO. 1 – GENERATOR 1. Hydrogen cooling and sealing systems	1. Hydrogen system a. Controls	No class
15th	INSTRUMENTS AND CONTROLS 1. Recorder board	1. Turbine supervisory instruments	No class
16th	TURBINE NO. 1 1. Starting and operating instructions	1. Testing, shutting-down procedures	Seven-week examination
17th	ELECTRICITY 1. Generator a. Theory b. Stability	1. Generator a. Theory b. Unit No. 1	1. Exciter a. Field rheostat b. Field rheostat
18th	ELECTRICITY 1. Voltage regulator a. Amplidyne generator	1. Generator leads a. Resistor, surge and potential cubicles	1. Transformers a. Main b. Auxiliary c. Starting
19th	ELECTRICITY 1. Transformer fire protection 2. Oil circuit breakers 3. Disconnects 4. Potential transformers	1. Relaying a. Station b. Line	1. Field trip a. Switching b. Unit layout
20th	HEAT BALANCE 1. Turbine condensate cycle	1. Low-pressure heater	1. Low-intermediate pressure heater
21st	HEAT BALANCE 1. High-intermediate pressure heater	1. High-pressure and cross-over heaters	No class
22nd	HEAT BALANCE 1. Evaporator	1. Closed cooling-water, gland-sealing systems	1. Turbine heat-balance auxiliaries a. Controls
23rd	MISCELLANEOUS 1. Lube-oil purification system	Examination	Graduation