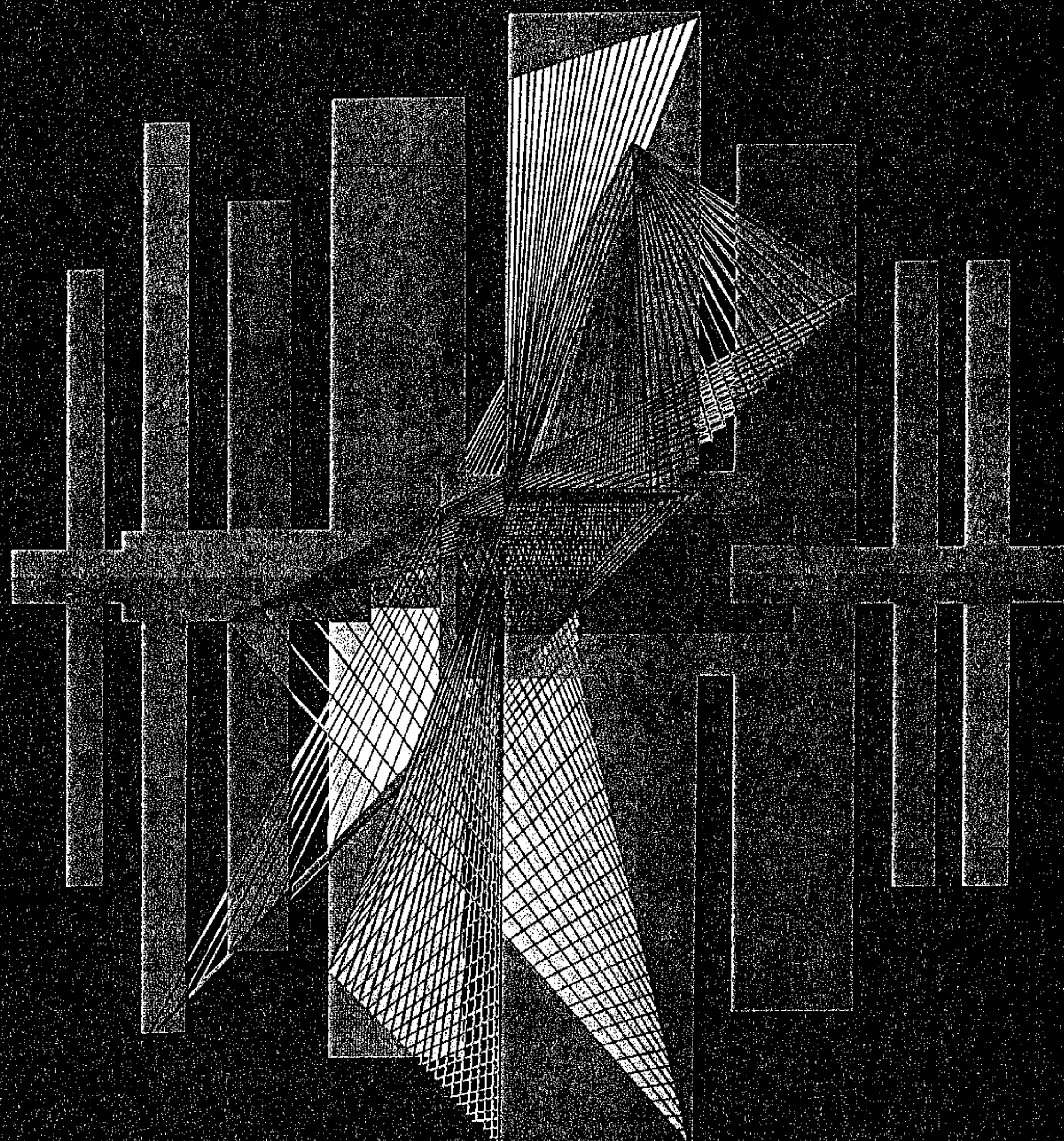
1984
ASHRAE Energy Awards



An Exclusive Special Report

ASHRAE JOURNAL

The 15 award winners in five categories represent successful energy management programs in new and existing structures in Australia, Canada, Japan and seven of the United States

Short and long term approach

An old facility producing rubber and felt products gains energy savings by abandoning steam plant and substituting specialized units

Award Recipient

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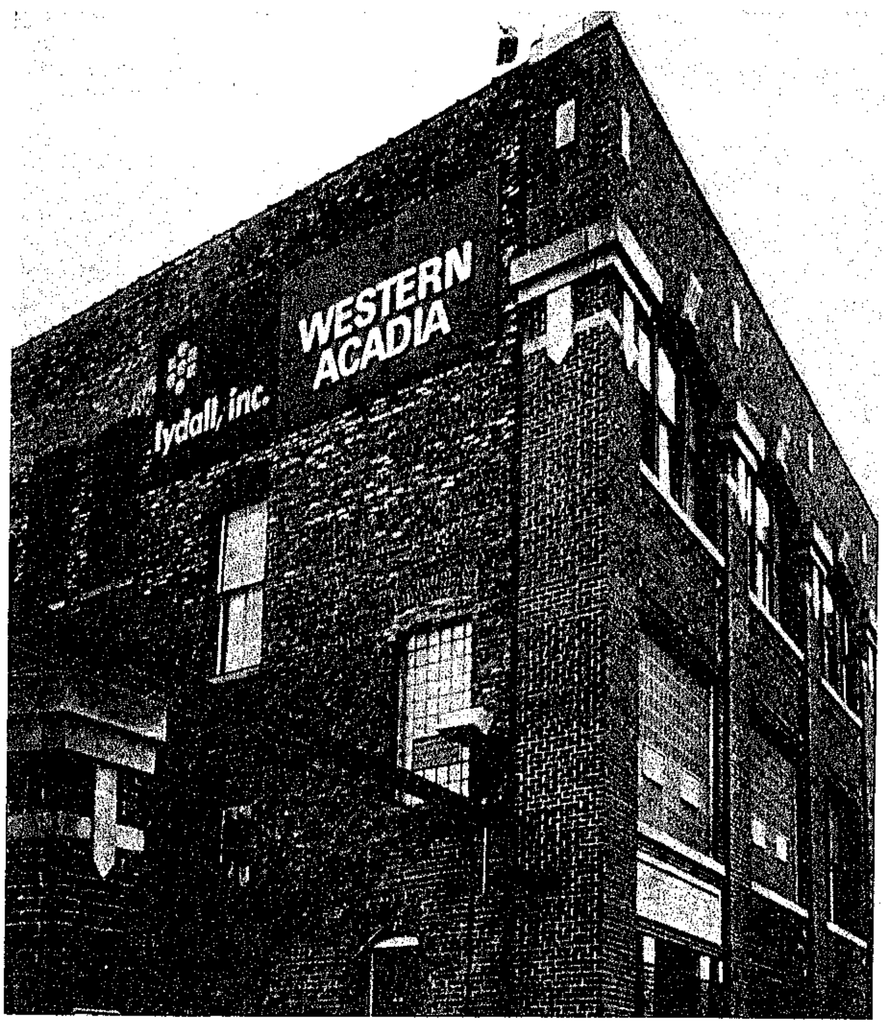
THE CHICAGO, Illinois, plant of Lydall, Inc., is housed in a 50-year old building. It covers approximately 390,000 ft^2 under roof. Plant growth was not a well-planned activity as evidenced by the poor utilization of constructed space and lack of records on the building and its systems.



Lydall Plant on west side of Chicago is over 50 years old

Operations were divided into two activities: the felt division, which occupied space west of the boiler house to produce felt and felt products, and the elastomer division, housed to the east of the boiler house to produce rubber products. Both operations start from basic raw materials manufactured through to a final product.

A central high pressure steam system provided process, winter heating and domestic hot water supply. Two boilers, each rated at 40,000-60,000 lb/h formed the core of the steam system. Steam was generated at 200 psig and distributed at about the same pressure to processes in both operations.

Peak steam demand was 20,000 lbs/h. While the high pressure steam was used primarily for manufacturing processes, several unit heaters had been tapped into the high pressure lines.

Steam at 15 psig was supplied to the plant heating system through a secondary steam system.

Steam distribution was very complex and old, with thousands of feet of steam and condensate piping spread over the plant. The condition of the insulation was poor. Condensate return and steam supply lines were uninsulated in many places. Several small condensate return units were used and flash steam was vented to the atmosphere. Steam traps were leaky, and at several places condensate was drained to the sewer.

The main HP steam header on the felt side was continuously blown down during production hours. A storage tank containing 40,000 gallons of #6 oil was heat-traced in order to provide back-up in case of a gas supply cutoff.

The steam plant was operated year-round since at any given time one or more users required steam.

Short and long term approach

Most operations in the rubber division were on a three-shift, five-days a week schedule, while most operations in the felt division were on a two-shift, five-days a week schedule. Occasionally both divisions worked Saturdays and Sundays.

A detailed energy audit at the end of 1980 indicated energy saving potentials of up to 60 percent. The recommendations for energy conservation were implemented in two phases.

The first phase of the implementation plan included all recommendations which had immediate or less than a year payback and could be included in the plant operating and maintenance budget.

These energy conservation methods included (1) replacement of incandescent bulbs with fluorescent lamps, (2) replacement of mercury lights by high pressure sodium lamps, (3) reduction of light levels, (4) reparation of compressed air leaks, (5) reparation of hydraulic system leaks, (6) reduction of westex dryer air flow, (7) abandonment of #6 oil backup to save on tank heat-tracing costs, (8) reparation of leaky steam valves and traps, (9) cut-off of unnecessary blow down of the steam, and (10) sealing of the plant envelope.

Phase two was the most important in the energy conservation effort. It included decentralization of the plant heat distribution system. The plant steam use profile revealed that about 48 percent of the energy supplied to the boiler was wasted through flue gases, steam leakage, condensate drain and transmission heat losses in winter, and 10 percent was the process heat.

In the middle of 1981, the decision was made to abandon existing steam distribution and the boiler plant and to provide alternate means of supplying thermal energy to the various steam users.

The old central system was replaced by a number of new systems.

1. *Hot Water for Felt Washers:* An 800,000 Btu/h instant hot water heater was provided to supply hot water to two felt washers and two tanks. These washers were required to operate eight to 12 hours a day.

2. *Press Conversion to Hot Oil Heating:* About 50 presses, each having two or more platens and/or molds were originally supplied with 320°F steam at 200 psig. A hot-oil heating system with 500°F fluid temperature and approximately 2.5×10^6 Btu/h capacity was installed.

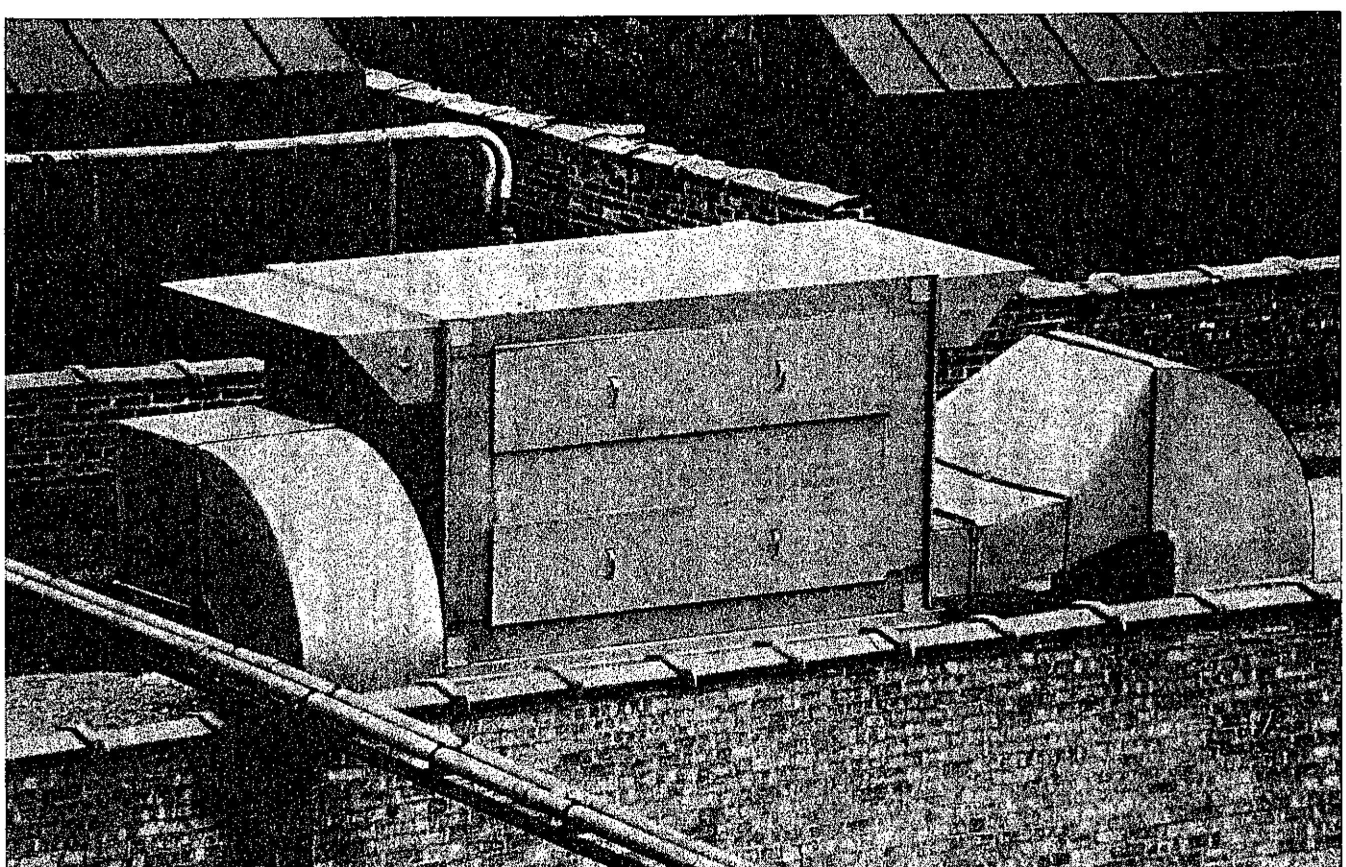
3. *High Pressure Steam for Felt Roll Presses:* A 1.5×10^6 Btu/h HP steam at 350°F was provided for a cluster of three-roll presses. Long steam supply and condensate return piping and connect steam traps and condensate return pumps were eliminated.

4. *Hot Water for Extruders:* A 350,000 Btu/h instant hot water heater was provided for heating extruders heads in the beginning of the day for one half hour, replacing the high pressure steam.

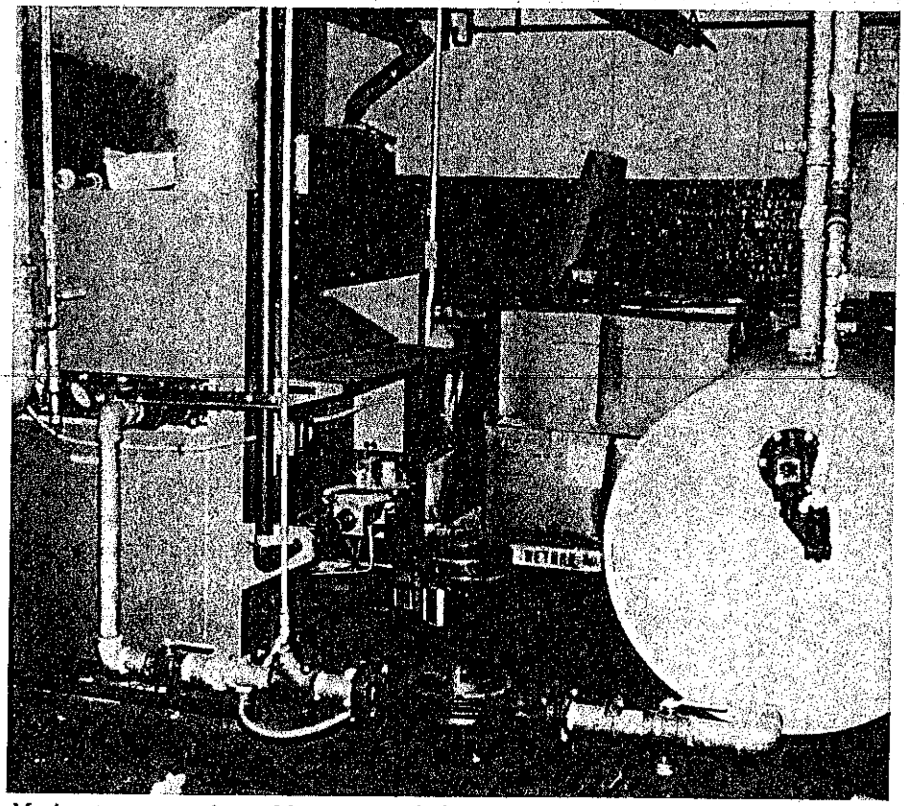
5. *Domestic Hot Water Supply:* The central steam heated hot water tank was replaced by 10 gas-fired water tanks to serve each washroom. The bulk of hot water usage was in two to three of the washrooms, for a period of about one hour at shift change.

6. *Heat Recovery System:* Six air-to-air heat exchangers were provided to recover heat from ventilation exhaust air. Four outside air supply and return air mixing fans take advantage of high temperature air in the upper spaces of the plant areas.

7. *Plant perimeter gas heating:* New direct or indirect fired or infra-red gas heaters with night and weekend setback controls were installed.



Rooftop air-to-air heat exchangers recover heat from the plant's exhaust air



Moving steam generation to felt presses cut the losses

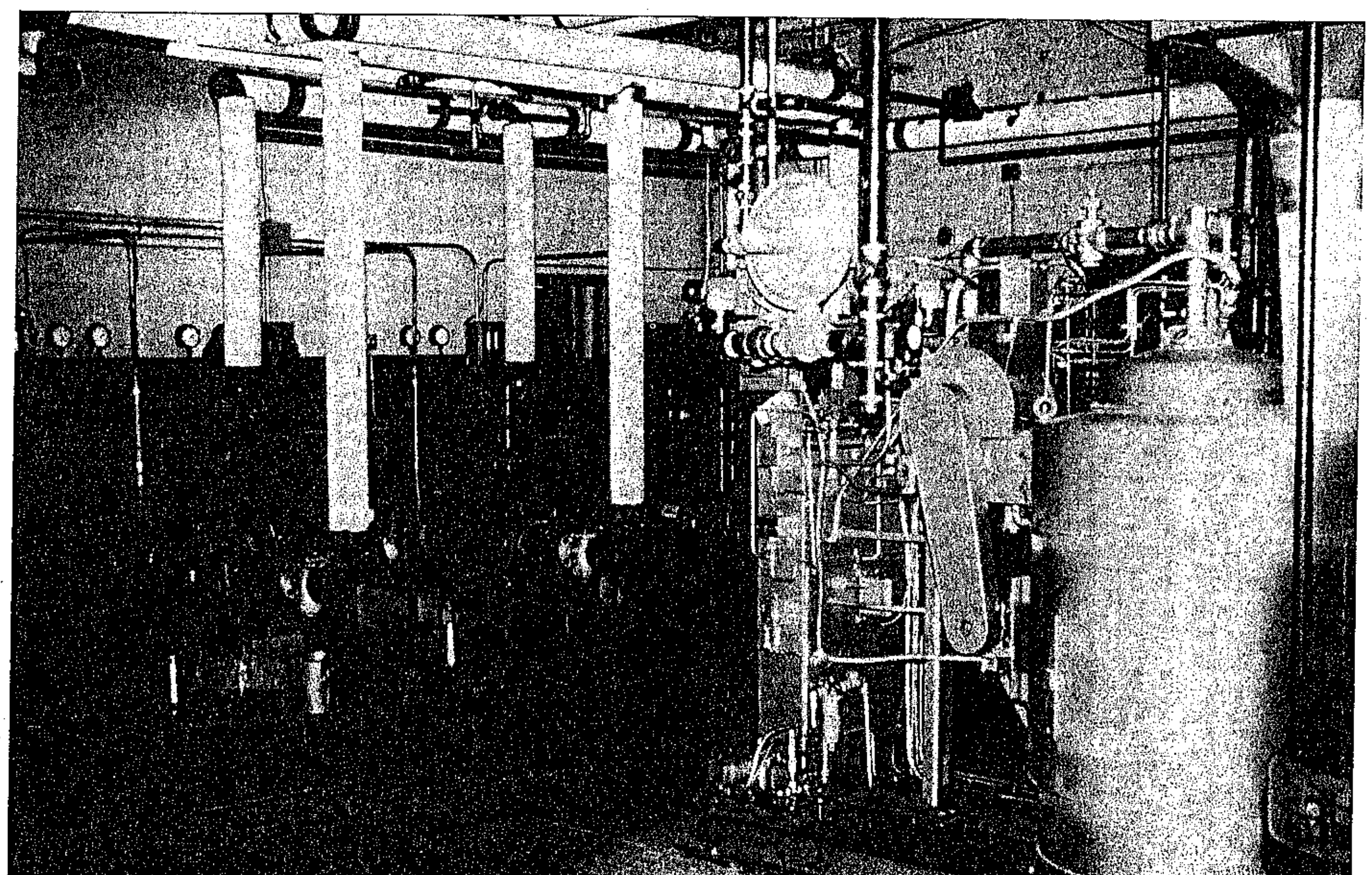
8. Office Heating by Low Pressure Steam Boiler: A 2.5 × 10^6 Btu/h gas- fired steam boiler was provided to meet office heating requirements. The boiler was equipped with microprocessor based controls for night and weekend setback, load cycling and optimum start controls.

One full year of plant operation after all the retrofits were implemented has shown phenomenal savings in gas and electrical energy costs.

From November 1979 through October 1980, before the retrofit program, the plant used 11,500,000 kWh at a cost of $453,048 and 111,243 cu ft of natural gas at a cost of $459,640.

In the March 1982 through February 1983 period, after the program was in place, the facility used 6,741,600 kWh at a cost of $491,223 and 48,002 cu ft at a cost of $236,436.

Total fuel cost before the program: $912,680. Total cost after the program: $727,669. The simple payback was 1.52 years. Savings not taken into account are the increased productivity of certain rubber products and the reduction of two stationary engineers who were required to attend the original central steam plant. ■



Specialized steam generation and hot water equipment replaced central system