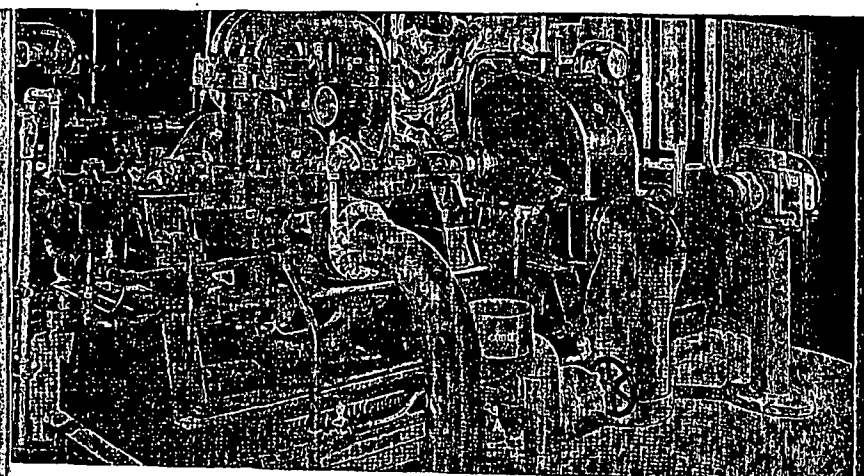
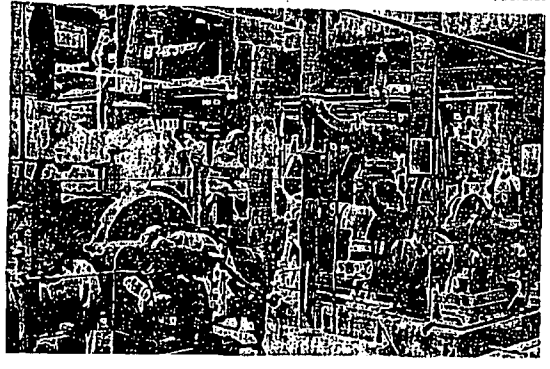


WHERE QUICK STARTING *must be provided in emergencies, mechanical-drive turbines will serve very well. This turbine-driven boiler feed pump represents typical installations of standby equipment that must pick up load at instant notice*

THOUGH TURBINES SUCH AS THESE, *serving a chemical plant, primarily drive centrifugal pumps they may also be regarded as supplying low-pressure-main steam*

TURBINE-DRIVEN PUMPS *can be made to operate safely in explosive atmospheres; most nonsparking precautions must be provided in accessory and control apparatus*



When to Use

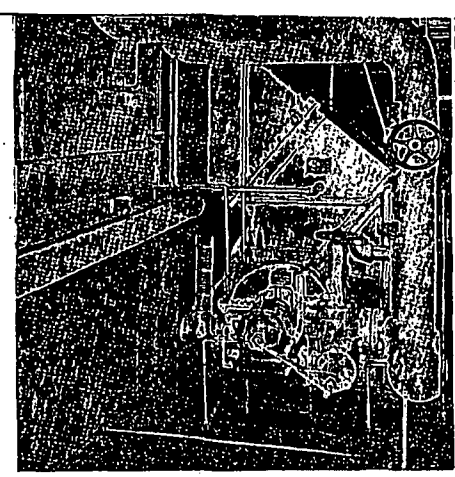
First of series by F S Kohl, turbine division, General Electric Co, on how's and why's of mechanical-drive turbines meeting various power and industrial steam requirements

▶ MECHANICAL-DRIVE TURBINES, properly applied, can be worth their weight in gold, but when improperly installed the user can't afford to accept them as gifts. The principles governing their selection are simple and it takes only a little study to lead to a proper decision in each case.

There are four situations in which turbine drives prove superior: (1) where their exhaust steam serves process and heating needs (2) where maximum protection against electric-power failure must be provided (3) where "waste-heat" steam or gas is available (4) where electric power is unavailable because of an overloaded system or total absence of supply.

In addition to the above considerations there are other advantages to take

AN OVERLOADED ELECTRIC SYSTEM *and increased demand for steam led to selecting this turbine for a paper mill*



FANS AND PUMPS IN HOT AND DAMP *locations can be safely and efficiently driven by mechanical-drive steam turbines*

Steam Turbines for Mechanical Drive

into account for using turbine drive: (1) adaptability to variable-speed needs (2) for direct high-speed applications (3) installation in hot or damp locations (4) safety in explosive locations. Seldom would one of these secondary advantages be of such importance that a turbine would be selected on such a basis only. They are, however, determining factors if study of primary benefits yields a borderline decision.

Process Steam. When low-pressure steam, 5 to 100 psig, serves process demands such as heating, drying, cooking, building heating, feedwater heating, etc, remarkable savings can be made by using turbines as "reducing valves" between boiler and working pressures. Turbines "skim off" about 10 to 20% of the heat in the steam leaving the balance available for other uses. Though extra heat must be supplied the boilers, the amount is small and the over-all power cycle becomes very efficient. For this reason, turbines can be applied economically up to the limit established by the low-pressure steam requirement.

Sometimes steam and power demands vary to such an extent that "doubled-up" equipment becomes economical to install. These may be either duplicate drives, some turbine and some motor, or dual drives, driven equipment with turbine on one end and motor on the other. Up to their capacity limits such arrangements provide maximum operating economy as the steam passing through conventional reducing valves stays at a minimum. Where frequent variations in steam demand occur the dual-drive arrangement is preferable. These units automatically follow the steam demand, giving them their name of "steam-balance" sets.

Inexpensive power from process steam is particularly important in industrial applications where process steam demands are heavy. In large power plants heating-steam needs are generally met by extraction from main turbine-generator units. But, where power plant expansions increase the demand for low-pressure steam this requirement can be met conveniently by exhaust steam from turbines driving boiler auxiliaries.

Power Failure. Service continuity must enter into every decision concerning selection of equipment. For vital apparatus normally driven by motors, good practice often drives the spares with turbines because of their reliability and their operation depending only on steam supply. Spare equipment such as boiler auxiliaries, fire pumps, exciter sets, house generators and lighting sets fall into this category.

Sometimes continuous operation may be so vital that time cannot be allowed for manual starting of the spare equipment. Under such circumstances automatic quick-starting control or dual-drive turbines can be used. The latter represents the ultimate in protection as the turbines can take over with hardly a change in speed.

Waste-Heat Applications. Lumber mills burning their sawdust, plants burning refuse, and reduction, cracking or catalytic process giving off heat typify industries having waste heat available. Conversion of waste heat into electrical or mechanical power often proves to be economical. When this heat fires a steam boiler, conventional steam turbines can be used. When the waste heat appears in a process gas under pressure conventional steam turbines can be modified for gas operation.

Steam Availability. In many cases, when steam is the only source of energy available, as in marine work, dredges, steam locomotives and the like, turbines may be the only type of drive to use. There are some land applications where existing main electrical circuits cannot handle added load because of

(*Continued on page 144*)