

SCIENCE

Thermofridge a cool operator

Simson L. Garfinkel *2/8*

THE SECOND Law of Thermodynamics sets limits on how much usable energy can be recovered from waste heat. Generally, the hotter the source of the waste heat, the more energy can be recovered. The Second Law also states that no matter what is done with energy - any kind of energy - in the end, heat is always generated.

While industry generates a lot of waste heat, explained Shai Vardi, general manager of Thermofridge Co. Ltd., most of the energy is thrown away, because the temperature isn't high enough. For example, in the production of electricity from coal or oil, 35 per cent of the energy in the fuel is eventually turned into electricity, while the remaining 65 per cent becomes waste heat in the 40-100C. range.

"Co-generation is defined as making use of this waste heat for heating or cooling purposes," said Vardi. Advocates of co-generation say that it saves fuel costs, since a greater proportion of the energy in the fuel is utilized.

While co-generation has been a popular idea in the United States since the mid-'70s, the idea has not gained much popularity in Israel. In this country's hot climate, the major energy expense in running a building

is not heating, but air-conditioning. While the 40-100 degree temperature of waste heat is fine for heating, it can't be used to air-condition buildings. At last it couldn't until Thermofridge, a one-year-old Beersheba-based company, started to manufacture its revolutionary chiller.

THE PRINCIPLES on which the Thermofridge operates are over a hundred years old, explained Vardi. The system is basically a heat-pump which transfers heat from a high temperature source to a low temperature sink. In transferring the heat, energy is produced that can be used "pump" heat out of - that is, to chill - a third heat source. The heat from the third heat source is also transferred to the sink.

A second way to cool air is to use a compression chiller. This system typically uses electricity to drive a compressor, which in turn produces refrigeration. Compression chillers became cost effective in the early '70s because of several technological developments in air compressors. But compression chillers require electrical or mechanical energy to operate - they cannot work on heat alone.

The Thermofridge chiller is unique because of the range of tempera-

tures on which it operates. While other absorptive chillers on the market require the high-temperature heat source, such as steam, to operate, the Thermofridge chiller can operate on hot water in the 60-100 degree range. This makes the Thermofridge chiller ideal for use with waste heat, taking energy that would be otherwise thrown away and putting it to work.

According to Efrin Starovisky, the company's manager, eight different patents contribute to the chiller's overall efficiency. The patents are licensed to Thermofridge by Tadir-an.

ONE IMPORTANT feature of the Thermofridge is that whereas most chillers use a mixture of water and ammonia as a refrigerant, this uses a mixture of water and lithium bromide. While chillers based on ammonia must be constructed with stainless steel to prevent corrosion, Thermofridge parts can be made with copper, making it less expensive. Also, the use of ammonia chillers in the U.S. is heavily regulated, especially in the food industry, since ammonia is poisonous. These regulations make competing chillers more expensive to install and operate than the Thermofridge unit.

Another unusual feature is the limitation of its moving parts to two small pumps and the absence of controls. The circulating pumps located at the base, need only be

inspected every three years, said Starovisky, and that is all the maintenance required. The lack of controls means that there is nothing to go wrong, added Vardi, and eliminates the energy losses associated with control systems.

Thermofridge produces an entire line of chilling units, the smallest capable of cooling a 2,000 sq.m. office building, the largest capable of providing "600 tons of refrigeration - for a building that would use 600 window air-conditioners," said Vardi. This unit "could easily cool a building the size of the Shalom Tower."

In addition to air-conditioning, the Thermofridge unit can be used for a variety of other purposes. It can be run in reverse as a very efficient heat pump for heating buildings. In an industrial plant that uses pressurized air, it can be employed to dry the air, and it can be powered by the hot oil used to lubricate the air compressor. In general, the system can be used wherever chilling is needed and waste heat is being produced.

The firm hopes to market its chillers primarily in the U.S., and Vardi said that one chiller has already been sold to a company in the San Francisco area. But, the firm is also submitting a proposal for a co-generation plant in Eilat which would provide several hotels with both electricity and air-conditioning.

Jerusalem

Astros 3, Cubs 2

Craig Reynolds's single knocked the winning run in the eighth inning after Alan Ashby's double led the game as the Houston Astros won for the 20th time in their last game with a 3-2 decision over the Chicago Cubs.

Braves 4, Cardinals 2

A two-out, two-run double by Dale Murphy in the eighth inning led the Atlanta Braves to a 4-2 victory over the St. Louis Cardinals.

Dodgers 3, Phillies 1

Fernando Valenzuela snapped a personal three-game losing streak with a four-hitter and Mike Scioscia and Bill Madlock homered, leading the Los Angeles Dodgers to a 3-1 victory over the Philadelphia Phillies.

AMERICAN LEAGUE EAST

	W	L	Pct.	GB
Boston	73	52	.584	-
New York	67	58	.536	6
Toronto	67	58	.536	6
St. Louis	67	60	.528	7
Baltimore	64	58	.525	7
Philadelphia	64	61	.512	9
Chicago	62	61	.504	10

WEST DIVISION

	W	L	Pct.	GB
California	69	56	.552	-
Oakland	66	59	.528	3
Seattle	57	68	.456	12
San Francisco	56	69	.448	13
Los Angeles	54	71	.432	15
San Diego	53	70	.431	15
Minnesota	53	71	.427	15 1/2

MONDAY'S GAMES: Oakland 8, Detroit 4; Kansas City 2, Chicago 0; California 5, New York 3; Texas 4, Boston 2.

CRICKET

Draw gives Kiwis first-ever series in England

LONDON (Reuter). - New Zealand, greatly assisted by heavy rain and bad light, completed their first Test series cricket victory in England yesterday when the third and final Test at the Oval was abandoned as a draw.

The touring side, who won the second Test by eight wickets after drawing the first, were required to face only six balls from Ian Botham as bad weather reduced the day's play to one over, itself split in two by a break for drizzle.

England, who declared their rain-curtailed first innings at their overnight score of 388 for five, a lead of 101, were unable to make any se-

rious attempt at bowling them out for a second time and thus conceded their second successive series defeat by New Zealand.

New Zealand also won the 1983-84 series in New Zealand, the last between the two teams, 1-0, and yesterday's draw at the bleak and rainswept Oval left England without a Test win since August last year.

The dismal conclusion brought triumphant joy for New Zealand captain Jeremy Conway and extended England's fruitless run to eleven Tests.

But England at least had the consolation of establishing a first innings lead for the first time in 12 months and seeing all-rounder Ian Botham return to international cricket in style after a two-month ban after admitting smoking cannabis.

Botham bowled and batted with something like his old fire and his three-wicket performance in New Zealand's first innings made him the top wicket-taker in Test history.

His batting - a swashbuckling 59 not out off 36 deliveries - even threatened to eclipse the accomplished centuries of David Gower and Mike Gatting who, with 131 and 121 respectively, had led England to a commanding position on Saturday, before the rainstorms.

Opener John Wright, who hit 119 in New Zealand's first innings total of 287, scored all seven runs yesterday. He cut a four off Botham's third ball and, after an interruption for drizzle, cut the fourth for a three before the inevitable rain fell again.

Viv escapes punishment for refusing drug test

LONDON (AP). - Viv Richards escaped punishment yesterday for refusing to take a mandatory drug test, telling the ruling body of English cricket that he would be "entirely happy" to submit to future drug analysis.

The Test and County Cricket board said after a two-hour meeting with Richards that the star batsman for the West Indies and Somerset explained he had refused to take the drug test because the procedures were not carried out in full view of the county squad.

He apologized to both his county

and also said that the board's disciplinary committee warned that any further refusal to submit to tests by any player would result in a fine or suspension. The committee is preparing guidelines for tightening up the test procedures, it said.

Richards refused to take the dope test following a match against Gloucestershire July 19, becoming the first player to fail to submit to the exam since it was made mandatory by the TCCB this season.

Last Saturday, Somerset announced that it would not re-sign Richards, generally considered to be the world's best batsman, or another West Indies veteran, Joel Garner, next season. The following day, it was disclosed that Richards had been called before the TCCB to explain his drug-test refusal.

Parting shot

WESTON-SUPER-MARE, England (AP). - Tom Fenn died doing what he loved best - playing cricket.

Fenn, a 58-year-old personnel administrator with a senior citizens office who had played cricket all over the world with the Royal Air Force, collapsed after slamming a long shot during a charity match in this resort town.

"It was the way he would have wanted to go," Dorothy Fenn, his wife, said yesterday. "He had gone to bat before it was his turn, trying to save the day for his team."

"He was playing such a good match," Mrs. Fenn said. "He had taken four wickets and was starting