Dairylicious' factory modernization: a buy or lease decision

In 2019, a dairy products and ice cream factory, Dairylicious, decided to renovate its refrigeration equipment and its distribution system, because they were not set at the optimum condition. For this purpose, Dairylicious set up a task force of energy and financing experts has been set up. Their task is to find out what is the appropriate machinery that needs to be replaced and how to finance it.

Dairylicious: Company background

The factory was designed in the 1970s for the production of dairy products (milk, yoghurt, cheese) and ice cream. Construction of the main production lines took place in the 1970s and the design was for the production of 1,500 tonnes of ice cream and around 300 tonnes of dairy products annually. It has not had any significant changes in its equipment since then.

Dairylicious was created by two Italian immigrant brothers, Mario and Luigi, who saw an opportunity to sell quality ice cream outside of their home country, but following their familial tradition. Their early success came because of their combined expertise. Mario secured favourable financing, while Luigi found a way to translate their old family recipe into a more industrial project using state of the art machinery.

However, since the 1970s, the factory has fallen in a state of general disrepair. This means that the facilities are already performing below capacity. Moreover, pressures the globalized market has created pressures from big ice cream manufacturers that are rapidly taking market share from Dairylicious. Luigi has finally agreed to replace some of the machinery that should help them decrease some costs while increasing production output in order to remain competitive. This is why a task force of energy and financing experts has been set up to determine what should be replaced and how it should be financed.

Dairylicious: Ice cream

The Dairylicious' main product is ice cream. They produce a wide range of ice cream forms and several different flavours. Back in the 1970's, their facilities were state of the art and one of their big competitive advantages was that the production of ice cream was relatively cheap compared to their competitors.

The production process of ice cream is the standardized: mixing of ingredients, pasteurization of mixed products, extrusion and forming, solidifying the products, shock freezing and storage of the final product. Ice cream is currently frozen fully to -25^{o}C, using a powerful shock freezer in the production line, then stored overnight before delivery next day. Ice cream production is regarded as seasonal, and is not produced in the winter. Some minimum stocks are stored for special requests during the winter period.

The task force discovers:

The designed annual (seasonal) production volume of ice cream is roughly 1,200 tonnes. Production is currently constrained below this level because of the old refrigeration plant equipment. The production line of the plant only operates from March to September. During January, February, October, November and December the only energy-consuming activity of the plant is refrigeration for a small amount storage of the final products for special orders during the period.

Energy Costs:

Thus, two different times of energy consumption:

- Storage (during the whole year)
- Production (from to September)

Using the prior year's energy consumption to estimate the share consumption for Storage and Production (See **Table 1**)**,** the task force concludes that 53% of the energy is used for storage while 47% is used for production**. In order to produce 1,220 tons of ice cream forecasted for next year the electricity consumption estimate is 1,400,000 kWh/year.** This results in 742 MWh for storage, and 658 MWh for production. Replacing 5 assets of the refrigeration plant would be able to deliver the same amount of ice cream (1,220) tons but for half of the energy consumption (see **Table 2**). This results in a savings of 700 MWh per year priced at 58 $/MWh.

Maintenance costs:

1. The compressors in the refrigeration plant are old, and they run on ammonia. This means they require significant maintenance work in order to maintain them at efficient levels of operation. There is significant leakage of ammonia from the piping of the refrigeration plant. This is especially noticeable within the premises of the production process where the smell of ammonia is particularly intense. Leakage in old refrigeration systems can cost up to 40% per year. Due to these leakages, 10 tons of new ammonia has to be purchased every year.
2. The refrigeration cells are concrete rooms with limited insulation (50 mm polyurethane foam) which could be increased in order to reduce the cooling losses.

In addition to the energy savings, the replacement of the 5 assets would also lead to cost savings related to the purchase of ammonia and maintenance costs of around 30,000 USD.

The energy and maintenance repairs will also have an impact on the firm's environmental impact.

Financing specialist's comments:

The country in which the factory is located has a very favorable tax rate. Dairylicious is in the 10% tax bracket. Moreover, tax laws will allow the asset to be depreciated using straight line depreciation for 15 years down to a book value of 20% of original investment), but the experts expect the residual value to be $3,000 higher than the book value. They would expect a project of similar risk to have yield an 18% return.

Dairylicious is a rather small company without an extensive credit history. This results in their cost of debt being relatively high. Their pre-tax cost for debt is estimated by using a government bond yield rate plus a risk premium is equal to 20%.

A specialized leasing company has offered an alternative. Dairylicious can lease the refrigeration equipment necessary for $77,900 per year. It is important to note that if Dairylicious chooses to lease, it will receive a tax exemption for the leasing payments.

Case Questions:

Does it make sense to install the equipment? Calculate the NPV of the project assuming

Dairylicious can buy the equipment right away with cash?

What is the appropriate discount rate to use for a Buy vs. Lease decision?

Should you buy or should you lease? What is the Net Advantage to Leasing?

Dairylicious can negotiate the lease terms,

- What lease payment would make Dairylicious indifferent between Leasing or Buying? What would be a favorable lease payment?
- Dairylicious is able to negotiate the lease down to 60,000. What is the NAL now?

Discuss how energy efficiency was used in the case

Table and Figures

Table 1.

	External Temp. (°C)	kWh(storage)	kWh(production)	% Energy consumed for storage
January	6	35,000	0	100
February	5	36,700	0	100
March	8	42,094	74,906	36
April	15	56,294	53,706	51
May	18	62,380	92,620	40
June	21	68,466	118,534	37
July	24	74,551	132,449	36
August	24	74,551	90,449	45
September	20	66,437	43,563	60
October	17	60,000	0	100
November	12	50,000	0	100
December	8	45,000	0	100
TOTAL		671,473	606,227	53%

Table 2.

Asset	Electrical power (kW)	Price	Electrical energy used (kWh/year)
Asset A	176	$ 135,000	616,000
Asset B	25	$ 69,000	18,750
Asset C	24	$ 60,000	18,000
Asset D	14	$ 80,000	10,500
Asset E	49	$ 66,000	36,750
TOTAL	288	$ 410,000	700,000