2.1. Energy Problem at Float Glass Industry

The glass industry consumes much energy. Fuels are burnt to create a high temperature inside the furnace, where the batch is reacted, vitrified, degassed, homogenized, and taken out as products. The fossil fuels (coal, petroleum, natural gas) as energy resources are limited resources. Energy saving or energy conservation efforts in industrial activities are directly connected to the effect of controlling the cost increase due to the reduction of unit energy consumption in industry, leading to intensified competition. At the same time, such efforts provide an essential means for the improvement of the global environment so that the human being will maintain its health for a long time to come. It is imperative for the industrialist to understand that the energy conversation is one of the most important policies for industry, the nation and the world.

The melting process is the greatest energy consumer in the plant provided with the tank furnace for continuous production. The figure records 75% on the tank furnace; it even reaches close to 82% when 7% for forehearth is added. Thus, when energy conservation efforts are made, top priority must be placed on the furnace, then on the lehr. The unit energy consumption means the energy required to make the product of unit amount (1 kg or 1 ton). It is expressed either by unit energy consumption if energy is used as the unit or by unit fuel consumption if the amount of
fuel is used as the unit. Basically, energy conservation in the glass factory is to reduce the unit energy consumption. To reduce unit energy consumption, it is necessary to reduce the amount of fuels used, while it is important as well to increase production without increasing the amount of fuels, and to reduce the failure rate of production.

Energy costs are significant for glass industry and, on average, account for around 14% of direct glass production costs. Natural gas accounts for nearly all purchased fuels and is the primary fuel used in melting and annealing processes.

![Figure 4: Float Glass Production Segment](image-url)
The melting and refining of glass in continuous furnaces is the most energy-intensive process step in glass production. Theoretically, 2.2 MMBtu are required to melt

![Figure 5: Float Glass Production Flow](image_url)
one short ton of glass. In reality, however, most modern furnaces consume significantly more energy, depending on the percentage of cullet in the feed. Up to 30% of the energy consumed by a furnace can be lost through its structure, while another 30% can be lost through flue gas exiting the stack. The fuel consumed in melting and refining depends foremost on the chemical composition and the share of cullet used, but also on the type of furnace. There is a wide variation in specific energy consumption between furnace types and even for the same furnace type. Important parameters affecting the furnace efficiency include the basic design, size, and age of the furnace, the type of glass being melted, the pull rate, and the type of fuel used (most furnaces are designed for a specific fuel; using other fuels can reduce efficiency).

After glass is melted and refined in the furnace, molten glass is passed into the forehearth where it is conditioned to a temperature suitable for forming. The molten glass is then formed using any number of different processes, which depend on the desired shape of the final product. Heavy fuel oil, natural gas and electricity are the main forms of energy used in forming. Most of the electricity is used to drive forming machines, fans, blowers, compressors, and. In forming processes where proper working temperatures need to be maintained, fuels and electricity are used to control the process heat. The energy used in forming is highly product dependent; for flat

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glass energy use in forming can account 12% of the total primary energy consumed in glass production.

Now and later the glass industry has to support high energy costs and high environmental constraints. In the near future a tremendous reduction of its CO2 emissions will be also requested. Facing high energy costs, what are the options for a glassmaker taking into account that 80% to 90% of the energy is used today in the form of fossil energy and the rest as electricity? Which evolution is required for further energy saving, CO2 reduction and pollution control in the manufacture of glass? What will be the cost and availability of fossil energy and which one will be available at a reasonable cost in the future? The package on energy and climate change will impose a very ambitious target to the manufacturing industry including glass. The energy reduction will not be sufficient and glass industry will need to develop innovative technologies implying actions on the glass composition, on cullet recycling and of course on energy type. In the mean time, glass industry has also to adapt the production to ever tighter environmental constraints. However, the application of the Kyoto Protocol is also a chance for the glass industry because a growing market can be foreseen for more and more sophisticated glass products which will allow energy saving and reduced CO2 emissions.

The goal of the glass technologist is to use a glass recipe for maximum glass yield, efficient use of plant assets, at minimal costs to achieve the best quality product.

2.2. Increment of Oil Price in 2005 and The Asahimas Performance

2.2.1. The Industry Background
PT Asahimas Flat Glass Tbk (Asahimas) is a foreign investment company established in 1971 as a pioneer of glass producers in Indonesia. Asahimas is a public company and has registered in Jakarta Stock Exchange (now Indonesian Stock Exchange) since 1995. Asahimas mission is “to build the world a better place for living” and its vision is “to be a respectable and global supplier of glass and related products”. While its motto is “never compromise but always challenge to difficulties”.

In the year 2005, Asahimas succeeded to achieve the sales value of Rp 1.7 trillion or increased by 18% compared with the year 2004. Asahimas recorded gross profit and operating profit amounted to Rp 570 billion and Rp 310 billion in the year 2005, respectively, or increased by Rp 42 billion and Rp 8 billion, compared with the year 2004. However, the gross profit margin and operating profit margin in the year 2005, both, decreased by 3% compared with last year, to become 33% and 18% respectively. The decrease in gross profit and operating profit margins mainly stimulated by the significant increment of oil price for industry and automotive in 2005 which caused the increment of its manufacturing cost and distribution cost 36% and 10% or amounting to Rp 310 billion and Rp 6 billion, respectively, compared to year 2004.

In 2006 Asahimas recorded total net sales value Rp.1.5 trillion or 10 % decreased compared to 2005. The hiking price of industrial fuel oil is one of the

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factor which causing a substantial increment in the production cost and distribution cost both for domestic as well as export.\textsuperscript{10}

\subsection*{2.2.2. Oil Price Increment in 2005}

Indonesian macro economic condition in year 2005 was marked by various economic, social and political challenges. The growing budget deficit and the increasing crude oil price have forced the government to start gradually eliminating the fuel subsidy. The government announced twice fuel price raises in year 2005, the first one on March 1, 2005 by an average of 29\% and the second one on October 1, 2005 by an average of 126\%.

Flat glass industry is categorized as energy intensive industry which characterized by the fact that energy represents a large part of the manufacturing cost. Hence, fluctuation of fuel oil price will directly influence performance of the industry.

\begin{figure}[h]
  \centering
  \includegraphics[width=\textwidth]{fig6}
  \caption{PGN’s Gas Tariffs vs. Oil Price\textsuperscript{11}}
\end{figure}

The year 2006 was year with full of challenges to Asahimas, reflected in decreasing demand on Asahimas’ products. In order to improve Asahimas’ performance, in 2006 Asahimas had implemented several measures, such as cost reduction activities related to several operation lines and continuously striving to improve quality and productivity. Asahimas also made a study to convert heavy fuel oil to natural gas. The conversions have to be done without loss of production, demanding good planning and coordination to make sure the changeover is smooth. From view of operational aspect, prior to the implementation, Asahimas have to consider several factor such as: its effect to the glass quality, energy efficiency, furnace life, maintenance equipment and also pollution.

2.2.3. The Case Developmant

This Case Study will be focused on the Asahimas effort to convert heavy fuel oil to natural gas as fuel to melt the glass. Also its general situation after two times increment of oil price in 2005 which showed in its annual report of 2005 and 2006, especially in 2006 while its total net sales value decrease 10 % compared to 2005.

As Asahimas face an increasingly competitive global business environment, they seek out opportunities to reduce production costs without negatively affecting product yield or quality. The volatility of energy prices can also negatively affect its earnings. In the face of growing challenges from foreign manufacturers and other materials, Asahimas seeks to reduce energy use as part of its broader effort to lower

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glass production costs. Fluctuations in heavy fuel oil prices greatly impact glassmaking margins and profitability. Asahimas believes the development of more energy-efficient manufacturing technologies will achieve significant energy savings and help to strengthen the competitiveness of glass products.

The following methodology is used in developing the case study:

1. Flat Glass Industry study, to give better perspective to the readers on the dynamic of flat glass industry. The data was collected from magazines, Indonesian central bank web site, as well as other relevant web sites. The main tool for research on the Internet was google search engine (http://www.google.com).

2. Data collection, from the company internal documents, from its annual report that published in the website of Indonesia Stock Exchange (http://www.idx.co.id) and the company website (http://www.amfg.co.id). All the company internal data has been acknowledge by Bambang Susilo, the company director as main source of this case study.