Enpro 356

Evaluating the Commercial Potential of IIT's Mercury Pollution Prevention Technology

Mid-term Progress Report

Group Members

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Updated Objectives

Our objective in this IPRO is to develop a business plan for Dr. Clack's VSB technology. The VSB is designed to remove mercury pollution from power plant emissions in a cost-effective manner. In developing this business plan, we are looking at the marketing strategy, market size, finances, and competition for this product. We are also looking at the government regulations governing this type of technology, at the business risks in developing the VSB and how to market it. The last objective for this IPRO is to develop a set of objectives and a path forward for any future IPROs on this topic. With this information we should have a business plan for developing and selling Dr. Clack's VSB technology.

Results to Date

In the first half of the IPRO, we worked on the following objectives:

- Market size
- Marketing strategy
- Competition

Results from Market Size

- The market will be driven by the new government regulations regarding mercury pollution from power plants
- There are 200 companies operating 422 coal-fired power plants
- In 2003 these companies spent $2 billion dollars on air pollution control
- The market is segmented by three different concerns: age, coal type and whether or not they have an electrostatic precipitator (ESP)
- Age is a concern because some of the plants may be grandfathered in and will not need to control mercury pollution. We are currently looking at the regulations to verify if this is a concern for us.
- The next major segmentation is whether or not the plant has an ESP. The VSB technology that Dr. Clack is developing is designed as an attachment to existing ESPs. As such, we are mainly interested in selling to plants with ESPs and plants that will be installing ESPs.
- The third segmentation is by coal type. The ideal type of coal is bituminous coal, as it is the most common type and it works well with technologies similar to the

VSB. Another coal type we are interested in is sub-bituminous. All other coal types are being ignored for our research as they concern only a very small part of the market.

- Table 1 shows the results of these segmentations

Table 1

Total ESP at Coal-Fired Power Plants	**1122**	All generators' Years >= 1970	**299**	Cold-Side	229	Bituminous Coal	**152**
						Subbituminous Coal	59
						Other Coals	18
				Hot-Side	70	Bituminous Coal	45
						Subbituminous Coal	25
						Other Coals	0
		Some generators' Years >= 1970	**292**	Cold-Side	221	Bituminous Coal	**172**
						Subbituminous Coal	47
						Other Coals	2
				Hot-Side	71	Bituminous Coal	58
						Subbituminous Coal	13
						Other Coals	**0**
		All generators' Years<1970	**531**				

Results from Marketing Strategy

- We examined three different marketing strategies: Selling, licensing and manufacturing
- Selling would entail selling all rights to the VSB, intellectual and otherwise. These rights would be sold to an intermediary who would then continue developing the VSB and manufacturing it. We would be paid a set amount that is

not linked to the amount of VSBs sold. Most of the profit would go to the intermediary, but the risk to us would be smaller.

- With licensing, we would retain intellectual rights to the technology. We would sell the right to produce the VSBs to intermediaries. We would then get paid a percentage of the sales of each VSB unit. This option contains more risks as we are paid per VSB, but we may get more profit in return. We could license out exclusive rights or not, depending on what % of sales would give us better options
- The third option is for us to manufacture the product ourselves. This would entail setting up a factory to produce it, hiring people to make it and other expenses. This option contains large risks, because all the risks and expenses are incurred by us, instead of being shared with an intermediary. The advantage is that we would not have to share the end profits with the intermediary. This option requires large amounts of capital and time to set up and we feel that it is not worth the risks involved.

Competition results

- In analyzing the competition, we looked at various other technologies that are trying to break into this market. We used a 70% efficiency cut-off to determine whether or not the opposing technology would be effective. We did this work prior to the publishing of the new laws concerning mercury removal. Once we understand what the new regulations are, we will go back and adjust this list accordingly. We examined the following technologies as competition:
  Hot-side ESP (H-ESP), Cold-side ESP (C-ESP), Fabric filter (FF), Spray-Dryers Absorbers(SDA) + FF, Flue gas desulphurization (FGD) + C-ESP, FGD+H-ESP, FGD + Wet Scrubber, Selective Catalytic Reduction (SCR), MerCap, Advanced Hybrid Filter, ECO Powerspan and various sorbent injection technologies.
- Out of these technologies, the following met the 70% cut-off:
  FF, H-ESP+FF, C-ESP+FF,SDA+FF, MerCap, Advanced Hybrid Filter, ECO powerspan,
- The SCR technology and the sorbent injection technologies can be used in conjunction with our technology and so were not considered actual competition.
- The ESP + FF designs are eliminated from the list of competitors as they are much more expensive than the other options
- The MerCap, Advanced Hybrid Filter and ECO powerspan technologies are still under development but they will provide us with competition, provided they meet EPA approval.
- That leaves our list of competing technologies at:
  FF, FF+SDA, Mercap, Advanced Hybrid filter and ECO powerspan.
- It is still necessary to do an in-depth cost analysis of these technologies.

Schedule for the remainder of the project

- We will be working on the following topics for the remainder of the semester.
- Finances, Risks, Regulations and Path-Forward
- All reports on these issues will be due by April 14th.

- The work is being divided into different sub-groups, with all reports due by then
- The remainder of the semester will be spent on polishing up the reports, developing the web page and preparing the IPRO day presentation.

Individual Assignments
Finances: Kim, Matt, Mia
Risks: Khiem
Regulations: Noel, Chris
Website: Khiem
Path Forward: Noel, Chris
Preparation for IPRO Day: Everyone

Barriers and Obstacles
- The main barrier facing the EnPro team is focused on the fact that the VSB is still in the developmental stages. Due to this, it is hard to make adequate estimations on a lot of key concepts; such as costs -running, implementation, etc-, effectiveness, competitive ability. This is complicated by the lack of standard in which other competitive technologies estimate their costs at. This will make financials and decision making very complicated for the team.

- The other barrier lies in understanding the regulations, as they are written for lawyers and politicians. We will need to dig through all the documents to discover the parts that are relevant for us.