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IFC SmartLessons

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Increasing Energy Efficiency in the Manufacturing Process in Bangladesh's Re-Rolling Mills

The re-rolling mill (RRM) industry, which turns scrap material into finished steel, is one of the most important suppliers to the construction industry in Bangladesh. Yet local RRM owners are unaware of, and left unaccountable for, their industry's adverse effects on the environment. This SmartLesson describes the challenges and lessons learned from the IFC SouthAsia Enterprise Development Facility's (SEDF) experience in working with RRM owners in Bangladesh to demonstrate the business case for looking after social and environmental concerns.

Background

With the economy booming (a growth rate of 5.7 percent per year for the past 15 years) and the construction industry in particular accounting for 9.2 percent of gross domestic product (GDP) and growing at 8 percent per year,¹ the scope and potential of the RRM industry are huge. Currently, there are around 150 RRMs operating in the market, and their total average output is 2.4 million tons per year.

Despite the growing insatiable domestic and global demand for steel products, the local RRM industry has not invested in improving product quality or even business expansion. Lack of modernization prevails within the industry. Most RRMs operate below optimal capacity due to constraints such as frequent power disruptions, low-pressure gas supplies, and low-quality raw materials. One bottleneck is a traditional mind-set that tends to focus only on the domestic market, resulting in basic low-value products and lower consolidation with the global supply chain. In addition, apathy from policymakers, civil society, and financial institutions has had little effect in shaking this stagnation.

One solution to help RRMs grow by achieving

sustainable and eco-friendly production methods might have been to purchase expensive machinery, but that requires investment by a sector for which access to finance is a major issue. Therefore, SEDF looked to modify technology to reduce the emission of burnt gases into the atmosphere.

SEDF Intervention

In 2006, SEDF brought in an international consultant to help identify interventions in RRMs. The consultant teamed up with a local service provider and identified interested RRMs to participate in a pilot project. The main objective of the pilot project was to change the mind-set of the RRM owners, who had not thought about using energy-efficient methodologies to improve work processes, increase productivity, reduce costs, and develop local resources knowledgeable in energy-efficient methodologies.

SEDF's consultant facilitated the design of a recuperator and a modified burner nozzle for the mill furnace to reduce gas consumption and raw material waste, known as scale loss. This was the first time any Bangladeshi RRM had used this technique. The result was lower carbon emissions into the atmosphere and better cost savings for the mill. After the first few cases of outstanding success (and cost

¹ 2005-2006. <http://www.mccibd.org/bdecon.html>

savings), more RRM's started approaching us for help. In doing this, SEDF picked one technician from each mill, recommended by the owner, and facilitated training for them in the basic design, fabrication, and installation of these devices. Altogether, these SEDF-trained technicians completed 21 interventions. Now the technicians are offering their services commercially to mills across the industry on a part-time basis in addition to their regular work, to supplement their normal salaries.

Results

"We were struggling badly with the rising raw material (scrap metal) cost that made us uncompetitive in the market in terms of production costs. SEDF's intervention brought about a relief, as it decreased our production cost by reducing gas consumption and scale loss by ~29% and ~32% respectively."

- Mr. Hafiz, Factory Manager, Al-Aksa Steel and Re-Rolling Mill

Data for 14 mills before and after installation suggest significant reductions in gas consumption and scale loss among RRM's that modified their reheating furnaces. As shown in Table 1, on average, gas consumption was 63.2 cubic meters per ton finished product prior to modification of the reheating furnace. After the installation of the devices that SEDF advised, gas consumption decreased to 43.4 cubic meters per ton. This represents an average consumption reduction of 19.8 cubic meters per ton, or 31 percent.

Table 1: Intervention Results for Gas Consumption

N=14	Minimum	Maximum	Mean
Gas consumption (m3) per ton (PRE)	42.4	98.3	63.2
Gas consumption (m3) per ton (POST)	33.7	57.0	43.4
Change in gas consumption (m3) per ton (PRE-POST)	-8.7	-41.3	-19.8
% change in gas consumption (m3) per ton (PRE-POST)	-20%	-42%	-31%

On the other hand, such intervention also brought significant savings in scale loss by reducing raw waste by about 32 percent per mill. If we translate these benefits (gas and scale) in terms of money for 21 mills, the total net annual benefit is about \$2.9 million. A one-time investment of

\$6,300 to install the devices resulted in monthly average savings of around \$15,000 for one mill, as shown in Table 2.

In the course of achieving these results, we learned a number of useful lessons.

Lessons Learned

1) Choose your area of intervention wisely based on where you can realistically make an impact.

The main raw material source for RRM is the ship-breaking industry, which demolishes ships for scrap. Apparently, only five to six ship-breaking industries control the market price of raw scrap material in the entire market by forming a syndicate. As the RRM industry is one of the most important building-material suppliers, it has a direct impact on the construction industry. In 2004, a ton of iron rod was sold at 18,000 Bangladeshi Taka (BDT), or \$257. In 2007, leveraging a temporary shortage of ships ready for scrapping, the ship-breaking industries increased the market price of scrap input metal for RRM's almost fivefold. To survive in the market, the RRM's thus had to raise the market price for one ton of iron rod to as high as 85,000 BDT (\$1,214). In a chain reaction, this compelled the construction industry to hike their building prices at least four to five times. As a result, the construction sector lost a significant market because the building price went beyond the purchasing capacity of a big middle-class society. To tackle this recession, the construction industry cut costs in their projects by reducing manpower, but that affected the country's labor market, as the construction industry itself employs around 1.5 million manual laborers.²

We initially thought of starting our intervention at the raw-material supply node of the value chain, but negotiating with the ship-breaker's syndicate was political and beyond our capacity. As a result, we shifted our focus to a process-oriented intervention.

2) Landing the first client is often the biggest hurdle, but be persistent.

After having decided to focus on the processing step of the value chain, we faced some challenges in creating demand among RRM owners to improve their mill production,

Table 2. Data for Al-Aksa Mill

	Production in ton, P	Gas consumption, cubic meter, F	Gas saving, cubic meter (A-F)	Monthly gas savings in \$ (A-F)*B*P	Scale loss, Kg/ton, G	Scale savings, Kg/ton (C-G)	Monthly scale savings in \$, (C-G)*D*P	Total monthly savings in \$
Jul 06	1,248	42	28	5,241	44	16	8,546	13,787
Aug 06	1,420	46	24	5,112	45	15	9,116	14,228
Sep 06	1,342	44	26	5,234	42	18	10,338	15,575

Base data: Average gas consumption, A = 70 cubic meter/ton, price of gas, B = \$ 0.15/cubic meter, average scale loss, C = 60 Kg/ton, price of scrap metal, D = \$ 428/ton, conversion rate, E: 1 US\$ = Bangladeshi Taka 70.00

² Source: Bangladesh Bureau of Statistics, 2005-06.

because local RRM owners were unaware and also not held to account for the environmental consequences of their production. Further, entrepreneurs in this field tend to think of the environment as part of their corporate social responsibility activities but not part of their cost-cutting strategies. Therefore, we knew we had to demonstrate tangible savings from gas consumption and scale loss from our proposed devices if we were to get real engagement from the mills, as owners could not immediately see the value-added from our approach.

To identify potential clients, the SEDF consultant and local service provider traveled from mill to mill to discuss the project with the owners and highlight the benefits of the new technology. After repeated visits and discussions, we were able to convince the owner of the New Alambagh Steel mill to be the first pilot when the mill's production was closed for a few days during a scrap metal shortage. While we had to show significant patience (seven to eight months) in finding the first client who was willing to test our recommendation before we were able to replicate the best practice, given the oral-based culture that prevails in Bangladeshi society and the fact that the sector players know each other and keep a close watch on what others are doing, we knew others would soon follow. We discovered later from our clients who installed the technology that neighboring mill owners and their technicians visited their mills to see what was done after hearing from other stakeholders. Even the owner of this first mill solicited our help in doing the same intervention at a second mill after seeing the tangible benefits at the first one. We also disseminated the results of our work through leaflets, videos, and stakeholder meetings.



Vivenker: Successful RRM Service Provider

3) Spend time developing not just the technical skills but the entrepreneurial spirit of key service providers.

To accomplish our objectives, we needed to find individuals who could cater services related to recuperator and modified

burner nozzle design, fabrication, and installation in the industry, even after our exit. The natural preference was for enthusiastic, technically sound, and business-minded individuals from the industry. However, the nature of the industry is such that long-serving employees may not be interested in giving up their jobs, losing ties to their masters, and, upon becoming entrepreneurs, compromising a regular monthly salary. At Al-Aksa Steel and Re-Rolling Mill, the third mill to accept IFC's business advice, the owner recommended someone who had skills and entrepreneurial spirit. Impressed by the interest and technical knowledge of Vivenker Ganguly, a regular RRM maintenance worker, the SEDF project team engaged him in this project through practical demonstration and also motivated him to take the job of designing, fabricating, and installing those devices for the sector.

Because he saw a substantial source of additional income potential, Vivenker decided to quit his 15-year career with a steel mill. To meet the growing demand of other RRMs, he established a workshop with a team of five laborers in a short period of time. Within the next 12 to 15 months, his team installed 14 recuperators in other RRMs. This work raised Vivenker's monthly income from BDT 10,000/month (\$143) to BDT 25,000-30,000/month (\$357-428), which helped him afford tuition fees for his two school-age children. At present, he is recognized as an important part of the value chain in the RRM sector.

4) Seek other ways to achieve your goals if the industry is not ready to commit to certain reforms.

Donors and development experts with a Western mind-set often refer to the need for compliance with workplace safety and environmental standards. Unfortunately, such standards often are not very convincing to entrepreneurs from their perspective. We learned from our experience in working with stakeholders such as the mill owners, researchers, association leaders, etc., that gender and workplace safety issues are not necessarily appealing to an industry that values immediate gains over compliance costs. Given all this, SEDF did not push workplace safety and other compliance issues to the industry, but proposed quality and productivity improvement initiatives in the hope that the



Gender is an important M&E indicator in RRM yet ignored



Workers in action with inappropriate shoes and safety measures.

in the recuperator and burner nozzle is around \$6,300. Considering the benefits, investment, and payback period, this solution is an attractive option to RRM owners. We also view the pilot as a great success because we used local resources and local service providers to implement the initiative.

However, in order to achieve long-term sector-wide impact, a well-planned, comprehensive, and focused intervention is needed from the very beginning. Replication will always be a

industry would grow to the point where it would invite initiatives to resolve workplace safety and compliance situations on its own.

For example, bare-handed women manually collect scrap metal that otherwise could easily be collected using magnetic field tools. But due to a lack of better business practices, they do not know the alternatives or the cost/benefit of using such tools. In some cases, they also take advantage of the nonexistent buyer pressure; in the local readymade garment sector, such pressure had been a catalyst for immense improvements in the working environment, including for workplace safety. As a result, the RRM owners put a great premium on being myopic and pocketing the cash they save through noncompliance.

Conclusion

The huge investment required for buying new technology is one of the major obstacles to promoting energy efficiency in industries most of the time. We started this project with a view to demonstrating the economic benefits of switching to energy-efficient technology by upgrading the existing technology.

In our view, the pilot has been extremely successful, as it created a true demonstration effect that encouraged many RRMs to pick up the changes and replicate them in their mills. Two service providers were developed that are currently serving the market, thus demonstrating that this is a cost-effective and self-sustaining model. The average investment

major challenge in project sustainability. We were taken aback when we discovered that some RRM owners take advantage of the absence of—or barely present—basic law enforcement. Many RRMs regularly do not pay for the gas they use in their mills. They have an illegal agreement with the operational staff of the government-owned gas distribution authority in which the government staff report back incorrect gas consumption readings or allow mill owners to connect with the gas line without official approval. In this way, these mill owners can save a lot of money, which in most cases is higher than the amount they could save by adopting IFC's suggestions. Thus, such owners are not interested in replicating our interventions. We came across some RRMs whose entire energy consumption (gas and electricity) was hooked to the government-owned gas pipe or connection illegally. As a result, the industries that do follow standard protocols and pay their bills on a regular basis become frustrated.

With our experience and all the lessons learned, we look forward to implementing this knowledge in future initiatives, particularly in the foundry subsector, as it is running inefficiently from an energy-consumption (coal) perspective, and a lot can be incorporated. Now that we have acquired the technical know-how, we have the confidence and courage to make things happen.

DISCLAIMER

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