

# Business Case: Retrofitting Sewing Machine Motors

## Support to Safety Retrofits and Environmental Upgrades in the Bangladeshi Ready-Made Garment (RMG) Sector.

### Safe Electricity by upgrading Sewing Machines

Although sewing operations are one of the most important processes in the RMG sector, sewing machine operators hardly use their machines more than a few seconds per work step. Therefore, machines are usually engaged for not more than 1.5h over a typical eight hour shift.<sup>1</sup> Since many of the RMG factories in Bangladesh are still equipped with clutch motors which are constantly operating at maximum speed and only engage the needle when a foot pedal is pressed, this can result in significant no-load energy losses.

#### Advantages of retrofitting sewing machine motors at a glance:

- Reduced energy costs
- Extended equipment life expectancy
- Reduced GHG emissions
- Reduced maintenance cost

To reduce no-load losses, it is possible to retrofit sewing machines with servo motors, which only run when the operator presses the pedal. Estimates show that by replacing clutch motors with servo motors, up to 83% of the energy demand of sewing machines can be saved. Depending on the no-load running times, this can translate into (estimated) electricity cost savings of between BDT 2,700 and BDT 37,900 per sewing machine and year. As the cost for replacing a clutch motor with a servo motor is between BDT 7,500 to BDT 23,076 per machine, the payback period of the investment usually ranges from 7 months<sup>2</sup> to 2.5 years.

Additional options for reducing the no-load losses of sewing machines with clutch motors include the installation of variable frequency drives (VFD), a type of controller that drives an electric motor by varying the supplied frequency and voltage. Whenever

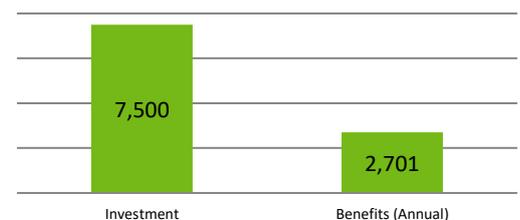
<sup>1</sup>GTZ (2010). Case Study on Energy Saving Measures in Bangladesh Readymade Garment Industrial Sector

<sup>2</sup>Ebd.

the sewing machine motors do not have to run at full speed a VFD can regulate the motor speed, reducing the overall energy consumption by up to 70%<sup>3</sup>.

Detailed information about the cost and benefits of retrofitting

#### Investment Cost and Annual Benefits (BDT per sewing machine)



Case study result from Bottom Gallery Pvt Ltd.

sewing machine motors can be found on the next page, followed by a case study on page 3. Technical details on the installation and implementation process as well as legal references and possible means of financing can be found on page 4.



Workers using Sewing Machine equipped with Servo Motor at Bottom Gallery Pvt Ltd, Dhaka

<sup>3</sup> What is a Variable Frequency Drive? Available online at: <https://www.vfds.com/blog/what-is-a-vfd>

## New Motors, Reduced Costs

Retrofitting the clutch motors of sewing machines with servo motors can save a lot of energy also reducing the GHG emissions of your factory. The following table shows the results of multiple case studies from the RGM sector in Bangladesh:

### Reduced energy costs (Examples):

Mavis Garments Ltd	Mavis Garments Ltd. commenced operation in 1985 as an export oriented Knit garments manufacturing factory, located in Joydevpur, Gazipur, with a built-up area of 3,250m <sup>2</sup> . The factory has knitting, cutting, sewing and finishing facility with a monthly production capacity of approximately 30,000 dozen of knit garments. The factory upgraded 120 sewing machines with servo motor saving 158 MWH per annum, resulting in savings of BDT 14.97 lakh per annum in energy costs. <sup>4</sup>
Misami Garments Ltd. (MGL)	MGL commenced operation in 1984 as an export oriented woven factory and located at Mirpur, Dhaka with a built-up area of 7,055m <sup>2</sup> . The factory has a sewing facility with an annual production capacity of approximately 300,000 PCs of woven garments. MGL upgraded 78 sewing machines with servo motor saving 46 MWH per annum, resulting in savings of BDT 3.68 lakh per annum in energy costs. <sup>5</sup>
Viyellatex Ltd.	VIYELLATEX is a knit garment industry having knitting, dyeing, printing, washing, embroidery & garmenting units and CAD-CAM design studio. The factory has 600-700 clutch & plate motors in 80 sewing lines the rest of the machines are already replaced by servo motors. It is estimated that retrofitting all motors would save 4,034 MWH per annum, resulting in savings of approximately BDT 24.59 lakh s in energy costs. <sup>6</sup>

### Other Benefits

Reduced Greenhouse Gas Emissions	Servo motors and VFDs reduce the demand for energy, therefore, also reducing GHG Emissions. Experiences from the Bangladesh textile Sector suggest that for each retrofitted motor up to 1.35 Tonnes of annual CO <sub>2</sub> emissions can be avoided. <sup>7</sup>
Extended equipment life expectancy and reduced maintenance costs	Reduced motor running time and speed increases the life experience of your machines and reduces maintenance cost. Furthermore, VFDs will offer better protection from motor issues such as electro thermal overloads, phase protection or under- and overvoltage.



Sewing machine with Servo Motor

## Calculating the Cost of Retrofitting Sewing Machine Motors

The cost of retrofitting sewing machine motors depends on the number of sewing machines with clutch motors and the selected technical solution. Retrofitting one (1) sewing machine with a servo motor will approximately cost BDT 7,500 (including installation cost)



Servo Motor's circuit and side view



Servo Motor inside view (without casing)

<sup>4</sup> PSES – Case Study Mavis

<sup>5</sup> PSES – Case Study MGL

<sup>6</sup>GTZ (2010). Case Study on Energy Saving Measures in Bangladesh Readymade Garment Industrial Sector

<sup>7</sup> Ebd.

## Case Study Spotlight: Bottom Gallery Pvt Ltd, Dhaka, Bangladesh

### Description of the Factory

Bottom Gallery Pvt Ltd. (Bottom Gallery) is an export-oriented garment manufacturer, located in Chandana, Gazipur. The factory's major production processes include cutting, sewing, finishing, and packing.

The monthly production capacity of the facility is 18,000 pieces per day. Bottom Gallery Pvt Ltd. spreads over 6,700 m<sup>2</sup> and currently employs around 1,800 workers.



Workers using sewing machine equipped with servo motor at Bottom Gallery Pvt Ltd, Dhaka

### Implemented Measures

In the textile and garment industry, the sewing section is often labelled as the most important department. Given the central function of the sewing, it is essential for any factory to realise the importance of providing the right machines for the right tasks.

Bottom Gallery's sewing section was equipped with 1,350 sewing machines powered by a clutch motor. These older sewing machines constantly operate at maximum speed and when the foot-lever is pressed the clutch is moved towards the motor, engaging the needle. This means that although the motor is constantly running at maximum speed the needle only starts stitching once the foot pedal is pressed. In the case of Bottom Gallery, the rated motor power of the sewing machines equalled 300W while the actual running power was identified to be approximately 230W. The disadvantage of using older machines equipped with a clutch motor is their high energy consumption due to relatively high idle time of the motors as well as a higher degree of noise pollution in the sewing section. Before the retrofit, Bottom Gallery's sewing section was using approximately 2,639 kWh per day.

As Bottom Gallery's management identified a huge potential for energy savings by reducing the idle time of the sewing machine motors, they decided to replace the clutch motors of 850 sewing-machines with servo motors. Compared to the clutch-motors the servo motors run at 100W when in use and 0W when idle, decreasing energy consumption drastically. After the servo motors were installed, energy consumption of the sewing section was reduced by approximately 1,000 kWh per day. After upgrading, the total energy consumption of the sewing section amounted to 1,700 kWh per day.

### Investments and Savings

Replacing the clutch motors with the servo motors took about 6 months and Bottom Gallery invested on average BDT 7,500 for each machine. Thus, upgrading the 850 sewing machines results in a total investment of about BDT 63.5 lakh.

As already mentioned, replacing the clutch motors with servo motors reduced the daily energy consumption from 2,639 kWh to 1,700 kWh, corresponding to energy savings of about 23,480 kWh per month or 281,700 kWh per year. This translates in savings for energy costs of about 22.9 lakh per year and a pay-back period of about 2 years and 9 months.

Description	Before	After	Units
Clutch type machines	1350	500	No's
Servo Machines	0	850	No's
Rated Power	300	450	W
Running Power	230	100	W
Energy Consumption	2639	1700	kWh/Day

### Key Performance Measures

Replacing the clutch motors with servo motors resulted in a reduction of the specific energy consumption of the sewing section from 4.9 Wh/pc to 3.1 Wh/pc, resulting in energy savings of 36% in terms of sectoral energy consumption.



Workers using sewing machine equipped with servo motor at Bottom Gallery Pvt Ltd, Dhaka



Servo Motor could be installed separately replacing the clutch motor

## References for Energy Efficiency measures in Bangladesh

Although no binding legal references regarding the efficient use of energy have come into effect in Bangladesh yet (May 2018), the government has recognized the increasing importance of energy as a factor of economic growth and declared Energy Efficiency to be a cross cutting issue for the country. To improve the country's energy efficiency, the Sustainable and Renewable Energy Development Authority (SREDA) in 2013 published the "Energy Efficiency and Conservation Master Plan (EECMP) up to 2030". The EECMP aims at improving energy intensity (national primary energy consumption per gross domestic product/GDP) in 2030 by 20% compared to the 2013 level. Under the action-plan of the EECMP, three EE&C programs are being promoted, namely, (1) Energy Management Program, (2) EE Labelling Program and (3) EE Buildings Program. In particular, the Energy Management program targets large industrial energy consumers in Bangladesh. Policy measures which are planned to be implemented in the next years include (amongst others): (i) Mandatory energy audits, (ii) energy consumption reporting and (iii) benchmarking. Furthermore, the authority is planning to develop and recommend procedures and regulations for the implementation of minimum energy performance standards and energy efficiency labelling for equipment and appliances<sup>8</sup>.

## Key Steps Required for Implementation

As per experience, retrofitting a sewing machine motor will take approximately 2 to 3 hours per machine. Upgrading all sewing machines in a medium sized RGM factory (1000 sewing machines) without disturbing the production will take no longer than 6 months (Including planning and procurement).

The following steps can help you to decide what steps have to be considered:

- Assess the number of sewing machines with clutch motors within your factory
- Select and the retrofitting solution as per your requirements
- Check for possible suppliers of servo motors or VDAs for sewing machines and select the offer most suitable for your purposes
- If installations services should not be offered by the selected supplier make sure that the retrofits are installed by technical personal skilled for the task.

## Availability of Materials in Bangladesh

The required materials can be sourced via local or international traders. You may contact Bottom Gallery Pvt Ltd. for their recommendations regarding possible suppliers.

## Nature of Services Required to Support the Implementation

- Inventory (Sewing machine) assessment by internal staff
- Installation of servo motors by factory engineers
- Maintenance services by factory engineers
- Worker training

## Possible Sources for Financing

SREUP credit line could be a good source of financing for such an investment.

Main Feature of SREUP Credit Line	
Loan Type	Normally Term Loan
Discount	Provision and possibility of 20% discount from loaned amount
Loan Tenure	3-5 years in general and in special case up to 7 years
Loan Limit	Normally up to 1 Million Euro and can be increased up to 3 Million Euro in special cases
Interest Rate	7% p.a. (maximum)
Grace period. Debt: Equity Ratio. Repayment	All issues are subject to agreement between borrower and lender



A sewing section equipped with servo motor of Bottom Gallery Pvt Ltd., Dhaka



Workers using sewing machine equipped with servo motor at Bottom Gallery Pvt Ltd, Dhaka

<sup>8</sup>SREDA (2015). Energy Efficiency and Conservation Master Plan up to 2030