The Svilosa Energy Efficiency PDD MP Workbook

SHEET ONE - Instructions

This workbook consists of nine worksheets as described in the table below.

Key for cell colours:
Title Cell
Unit Cell
Input Cell
Calculation Cell
The operator should input data into the **brown** cells

	Title	Description
Sheet One	Instructions	Introduction and instructions for MP worksheet use
Sheet Two	EC NCF	Emission Factors; Fuel Heating Values; Energy Conversion Efficiency Factors
Sheet Three	EEM01	MP for Replacement of cyclone evaporator with a new super concentrator for black liquor in Soda Recovery Boiler
Sheet Four	EEM02	MP for Replacement of a barometric condensers with plate heat exchangers in evaporating systems for black liquor
Sheet Five	EEM03	MP for Installation of frequency control drives on electric motors
Sheet Six	EEM04	MP for Installation of a back pressure steam turbine to utilize steam generated by SRB and cogeneration of electricity
Sheet Seven	EEM05	MP for Installation of blow down heat recovery system for SRB
Sheet Eight	EEM06	MP for Shift of production from pulp blocks to pulp sheets
Sheet Nine	Consolidata	Calculation of total project emission reductions

		Year						
Emission Factors	UoM	2007	2008	2009	2010	2011	2012	Note
Coal	tCO_2/t coal							Official data yearly supplied by the power plant
Electricity purchased from power plant	tCO_2/MWh							Determined by using the "combined margin method"
Diesel	tCO_2/ton fuel	3,21	3,21	3,21	3,21	3,21	3,21	From WRI - WBCSD GHG Protocol tables
Heavy Fuel Oil n.6 (mazut)	tCO_2/ton fuel	3,11	3,11	3,11	3,11	3,11	3,11	From WRI - WBCSD GHG Protocol tables
Fuel Heating Values	UoM	2007	2008	2009	2010	2011	2012	Note
Coal	MWh/ton fuel							Official data fyearly supplied by the power plant
Heavy Fuel Oil	MWh/ton fuel	11,16	11,16	11,16	11,16	11,16	11,16	Revised 1996 IPCC Guidelines for Nat.l GHG inventories
Diesel	MWh/ton fuel	12,04	12,04	12,04	12,04	12,04	12,04	Revised 1996 IPCC Guidelines for Nat.l GHG inventories
Energy Conversion Efficiency Factos	UoM	2007	2008	2009	2010	2011	2012	Note
Power Plant Thermal Efficiency	%							Official data yearly supplied by the power plant
Electricity Transmission losses (ETL)	%	10%	10%	10%	10%	10%	10%	Conservative estimation

Company: Svilosa AD **Reference:** SVP-01

Efficiency Measure: Replacement of cyclone evaporator with a new super concentrator for black liquor in Soda Recovery Boiler

		Year						
BASELINE CALCULATION		2007	2008	2009	2010	2011	2012	Note
Black liquor flow rate	t/h							measured
Average Calorific value of black liquor @ 60% tds	kcal/kg							calculated
Annual working hours for SRB	hours							measured
SRB efficiency	%	67%	67%	67%	67%	67%	67%	
Outlet steam temperature	°C							measured
Outlet steam pressure	bar							measured
Thermal input at SRB from black liquor	MWth	0,0	0,0	0,0	0,0	0,0	0,0	
Thermal power output of steam from SRB	MWth	0,0	0,0	0,0	0,0	0,0	0,0	
Outlet steam enthalpy	kJ/kg							calculated
Inlet water enthalpy	kJ/kg							calculated
Steam produced by SRB	t/h	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
Thermal energy produced	MWh/y	0	0	0	0	0	0	
Black liquor inlet concentration	%							measured
Black liquor outlet concentration after evaporator	%							measured
Steam consumption for evaporation of 1 t water	tsteam/twater	0,185	0,185	0,185	0,185	0,185	0,185	
Water flow for evaporation	t/h	0,00	0,00	0,00	0,00	0,00	0,00	
Annual quantity of water for evaporation	t/y	0	0	0	0	0	0	
Steam consumption for evaporation of all water	t/y	0	0	0	0	0	0	
Steam consumption for evaporation of all water	MWh/y	0	0	0	0	0	0	
Steam production from SRB	MWh/y	0	0	0	0	0	0	
Steam otherwise purchased from CHP	MWh	0	0	0	0	0	0	calculated as in absence of the project
CO2 emissions from steam consumption	tCO_2	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	

Company: Svilosa AD **Reference:** SVP-01

Efficiency Measure: Reconstruction of Soda Recovery Boiler (SRB) and replacement of cyclone evaporator with a new super concentrator for black liquor

		Year						
PROJECT EMISSIONS		2007	2008	2009	2010	2011	2012	Note
Black liquor flow rate	t/h	0,0	0,0	0,0	0,0	0,0	0,0	
Average Calorific value of black liquor @ 72% tds	kcal/kg							calculated
Annual working hours for SRB	hours	0	0	0	0	0	0	
SRB efficiency	%							calculated
Outlet steam temperature	°C	0	0	0	0	0	0	
Outlet steam pressure	bar	0	0	0	0	0	0	
Thermal input at SRB from black liquor	MWth	0,0	0,0	0,0	0,0	0,0	0,0	
Thermal power output of steam from SRB	MWth	0,0	0,0	0,0	0,0	0,0	0,0	
Outlet steam enthalpy	kJ/kg							calculated
Inlet water enthalpy	kJ/kg							calculated
Steam produced by SRB	t/h	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
Thermal energy produced	MWh/y	0	0	0	0	0	0	
Black liquor inlet concentration	%	0%	0%	0%	0%	0%	0%	
Black liquor outlet concentration after superconcentrator	%							calculated
Steam consumption for evaporation of 1 t water	tsteam/twater	0,185	0,185	0,185	0,185	0,185	0,185	
Water flow for evaporation	t/h	0,00	0,00	0,00	0,00	0,00	0,00	
Annual quantity of water for evaporation	t/y	0	0	0	0	0	0	
Steam consumption for evaporation of all water	t/y	0	0	0	0	0	0	
Steam consumption for evaporation of all water	MWh/y	0	0	0	0	0	0	
Steam production after energy efficiency measures	MWh	0	0	0	0	0	0	
Steam purchased from CHP	MWh							
CO2 emissions from steam consumption	tCO_2	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	

Company: Svilosa AD **Reference:** SVP-01

Efficiency Measure: Reconstruction of Soda Recovery Boiler (SRB) and replacement of cyclone evaporator with a new super concentrator for black liquor

		Year						
EMISSIONS REDUCTION		2007	2008	2009	2010	2011	2012	Note
Baseline scenario emission	tCO_2	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
Project scenario emission	tCO_2	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
Total project emission reduction	tCO_2	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	Total crediting period 2007-2012= #DIV/0!

Company: Svilosa AD **Reference:** SVP-02

Efficiency Measure: Replacement of a barometric condensers with plate heat exchangers in evaporating systems for black liquor

BASELINE CALCULATION		Year 2007	2008	2009	2010	2011	2012	Note
Quantity of black liquor at 100% concentration	t/day							calculated
Annual working hours	hours							measured
Black liquor concentration after WASHING	%	13	13	13	13	13	13	
Quantity of black liquor after WASHING	t/day	0	0	0	0	0	0	
Black liquor concentration after heat exchanger	%	54	54	54	54	54	54	
Quantity of black liquor after heat exchanger	t/day	0	0	0	0	0	0	
Evaporated quantity of water	t/day	0	0	0	0	0	0	
Steam temperature	0C							measured
Steam pressure	bar							measured
Steam enthalpy	kJ/kg							calculated
Condensate enthalpy at T=60oC P=0.78 bar	kJ/kg							calculated
Heat for 1 kg generated steam	kJ/kg	0	0	0	0	0	0	
Steam consumption for evaporation of 1 t water	tsteam/twater	0,185	0,185	0,185	0,185	0,185	0,185	
Steam consumption for evaporation of all water	tsteam/day	0	0	0	0	0	0	
Steam consumption for evaporation of all water	tsteam/y	0	0	0	0	0	0	
Steam consumption for evaporation of all water	MWh/y	0	0	0	0	0	0	
CO2 emissions from steam consumption	tCO_2	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	

Company: Svilosa AD **Reference:** SVP-02

Efficiency Measure: Replacement of a barometric condensers with plate heat exchangers in evaporating systems for black liquor

PROJECT EMISSIONS		Year 2007	2008	2009	2010	2011	2012	Note
Quantity of black liquor by 100% concentration	t/day	0	0	0	0	0	0	
Annual working hours	hours	0	0	0	0	0	0	
Black liquor concentration after WASHING	%							measured
Quantity of black liquor after WASHING	t/day	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
Black liquor concentration after heat exchanger	%							measured
Quantity of black liquor after heat exchanger	t/day	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
Evaporated quantity of water	t/day	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
Steam temperature	0C	0	0	0	0	0	0	
Steam pressure	bar	0	0	0	0	0	0	
Steam enthalpy	kJ/kg	0	0	0	0	0	0	
Condensate enthalpy at T=60oC P=0.78 bar	kJ/kg	0	0	0	0	0	0	
Heat for 1 kg generated steam	kJ/kg	0	0	0	0	0	0	
Steam consumption for evaporation of 1 t water	tsteam/twater	0,185	0,185	0,185	0,185	0,185	0,185	
Steam consumption for evaporation of all water	tsteam/day	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
Steam consumption for evaporation of all water	tsteam/y	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
Steam consumption for evaporation of all water	MWh/y	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
CO2 emissions from steam consumption	tCO_2	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	

Company: Svilosa AD **Reference:** SVP-02

Efficiency Measure: Replacement of a barometric condensers with plate heat exchangers in evaporating systems for black liquor

EMISSIONS REDUCTION		Year 2007	2008	2009	2010	2011	2012	Note
Baseline scenario emission	tCO_2	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
Project scenario emission	tCO_2	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
Total project emission reduction	tCO_2	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	Total crediting period 2007-2012= #DIV/0!

Company: Svilosa AD **Reference:** SVP-03

Efficiency Measure: Installation of frequency control drives on electric motors

BASELINE CALCULATION		Year 2007	2008	2009	2010	2011	2012	Note
Pump type: MOM315M-4								
Nominal Power	kW	132	132	132	132	132	132	
Average power absorbed	kW							measured
Operating hours	hr							measured
Load factor	%	0%	0%	0%	0%	0%	0%	
Motor efficiency	%							calculated based on specific load-efficiency curve
Energy consumption	kWh	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
Pump type: MOM315S-4								
Nominal Power	kW	200	200	200	200	200	200	
Average power absorbed	kW							measured
Operating hours	hr							measured
Load factor	%	0%	0%	0%	0%	0%	0%	
Motor efficiency	%							calculated based on specific load-efficiency curve
Energy consumption	kWh	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
Pump type: MOM315M-4								
Nominal Power	kW	200	200	200	200	200	200	
Average power absorbed	kW							measured
Operating hours	hr							measured
Load factor	%	0%	0%	0%	0%	0%	0%	
Motor efficiency	%							calculated based on specific load-efficiency curve
Energy consumption	kWh	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
Pump type: MO280M-2								
Nominal Power	kW	132	132	132	132	132	132	
Average power absorbed	kW							measured
Operating hours	hr							measured
Load factor	%	0%	0%	0%	0%	0%	0%	
Motor efficiency	%							calculated based on specific load-efficiency curve
Energy consumption	kWh	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
Electricity consumption from current motors	kWh	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
Electricity demand prior to distribution losses	MWh	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
CO2 emissions from electricity consumption	tCO_2	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	

Company: Svilosa AD **Reference:** SVP-03

Efficiency Measure: Installation of frequency control drives on electric motors

PROJECT EMISSIONS		Year 2007	2008	2009	2010	2011	2012	Note
Pump type: MOM315M-4								
Operating hours	hr	0	0	0	0	0	0	equal to baseline data
Average power absorbed	kW	0	0	0	0	0	0	equal to baseline data
Energy consumption	kWh	0	0	0	0	0	0	
Pump type: MOM315S-4								
Operating hours	hr	0	0	0	0	0	0	equal to baseline data
Average power absorbed	kW	0	0	0	0	0	0	equal to baseline data
Energy consumption	kWh	0	0	0	0	0	0	
Pump type: MOM315M-4								
Operating hours	hr	0	0	0	0	0	0	equal to baseline data
Average power absorbed	kW	0	0	0	0	0	0	equal to baseline data
Energy consumption	kWh	0	0	0	0	0	0	
Pump type: MO280M-2								
Operating hours	hr	0	0	0	0	0	0	equal to baseline data
Average power absorbed	kW	0	0	0	0	0	0	equal to baseline data
Energy consumption	kWh	0	0	0	0	0	0	
Total electricity consumption with VSD	kWh	0	0	0	0	0	0	
Electricity demand prior to distribution losses	MWh	0	0	0	0	0	0	
CO2 emissions from electricity consumption	tCO_2	0	0	0	0	0	0	

Company: Svilosa AD **Reference:** SVP-03

Efficiency Measure: Installation of frequency control drives on electric motors

EMISSIONS REDUCTION		Year 2007	2008	2009	2010	2011	2012	Note
Baseline scenario emission	tCO_2	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
Project scenario emission	tCO_2	0	0	0	0	0	0	
Total project emission reduction	tCO_2	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	Total crediting period 2007-2012= #DIV/0!

Company: Svilosa AD **Reference:** SVP-04

Efficiency Measure: Installation of a back pressure steam turbine to utilize steam generated by SRB and cogeneration of electricity

BASELINE CALCULATION		Year 2007	2008	2009	2010	2011	2012	Note
Electricity purchased from the grid	MWh							measured
Electricity demand prior to distribution losses	MWh	0	0	0	0	0	0	
CO2 emissions from electricity consumption	tCO_2	0	0	0	0	0	0	

Company: Svilosa AD **Reference:** SVP-04

Efficiency Measure: Installation of a back pressure steam turbine to utilize steam generated by SRB and cogeneration of electricity

PROJECT EMISSIONS		Year 2007	2008	2009	2010	2011	2012	Note
Electricity generated from steam turbine	MWh							measured
Electricity purchased from the grid	MWh	0	0	0	0	0	0	
Electricity demand prior to distribution losses	MWh	0	0	0	0	0	0	
CO2 emissions from electricity consumption	tCO_2	0	0	0	0	0	0	

Company: Svilosa AD **Reference:** SVP-04

Efficiency Measure: Installation of a back pressure steam turbine to utilize steam generated by SRB and cogeneration of electricity

EMISSIONS REDUCTION		Year 2007	2008	2009	2010	2011	2012	Note
Baseline scenario emission	tCO_2	0	0	0	0	0	0	
Project scenario emission	tCO_2	0	0	0	0	0	0	
Total project emission reduction	tCO_2	0	0	0	0	0	0	Total crediting period 2007-2012= 0

MWH

Company: Svilosa AD **Reference:** SVP-05

Efficiency Measure: Installation of blow down heat recovery system for SRB

BASELINE CALCULATION		Year 2007	2008	2009	2010	2011	2012	Note
Average steam production over the year	t/h							measured
Annual working hours for SRB	hours							measured
Average blow down rate	%	3%	3%	3%	3%	3%	3%	
Annual quantity of blow down water	kg/s	0,00	0,00	0,00	0,00	0,00	0,00	
Temperature inlet heat exchanger	0C	250	250	250	250	250	250	
Temperature outlet heat exchanger	0C	60	60	60	60	60	60	
Specific heat of water	kJ/(kg oC)	4,186	4,186	4,186	4,186	4,186	4,186	
Thermal power dissipated through water blow down	kW	0	0	0	0	0	0	
Heat dissipated through water blow down	MWh	0	0	0	0	0	0	
CO2 emissions from steam consumption	tCO_2	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	

Company: Svilosa AD **Reference:** SVP-05

Efficiency Measure: Installation of blow down heat recovery system for SRB

PROJECT EMISSIONS		Year 2007	2008	2009	2010	2011	2012	Note
Average steam production over the year	t/h	0	0	0	0	0	0	
Annual working hours for SRB	hours	0	0	0	0	0	0	
Average blow down rate	%							measured
Annual quantity of blow down water	kg/s	0,00	0,00	0,00	0,00	0,00	0,00	
Temperature inlet heat exchanger	0C							measured
Temperature outlet heat exchanger	0C							measured
Specific heat of water	kJ/(kg oC)	4,186	4,186	4,186	4,186	4,186	4,186	
Thermal power recovered	kW	0	0	0	0	0	0	
Heat recovery	MWh	0	0	0	0	0	0	
Heat dissipated through water blow down	MWh	0	0	0	0	0	0	
CO2 emissions from steam consumption	tCO_2	0	0	0	0	0	0	

Company: Svilosa AD **Reference:** SVP-05

Efficiency Measure: Installation of blow down heat recovery system for SRB

EMISSIONS REDUCTION		Year 2007	2008	2009	2010	2011	2012	Note
Baseline scenario emission	tCO_2	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
Project scenario emission	tCO_2	0	0	0	0	0	0	
Total project emission reduction	tCO_2	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	Total crediting period 2007-2012= #DIV/0!

MWH

Company: Svilosa AD **Reference:** SVP-06

Efficiency Measure: Shift of production from pulp blocks to pulp sheets

BASELINE CALCULATION		Year 2007	2008	2009	2010	2011	2012	Note
Total production	t/y							
Block pulp output for 2004	t/y	0	0	0	0	0	0	58% of total production in BAU scenario
Specific diesel consumption in blocks line	t/tpulp	0,04	0,04	0,04	0,04	0,04	0,04	
Specific steam consumption in blocks line	MWh/tp	0,96	0,96	0,96	0,96	0,96	0,96	
Specific electricity consumption in blocks	MWh/tp	0,28	0,28	0,28	0,28	0,28	0,28	
Sheet pulp output for 2004	t/y	0	0	0	0	0	0	
Specific diesel consumption in sheets line	t/tp							calculation
Specific steam consumption in sheets line	MWh/tp							calculation
Specific electricity consumption in sheets	MWh/tp							calculation
Steam consumption from Power Plant	MWh	0	0	0	0	0	0	
Electricity consumption	MWh	0	0	0	0	0	0	
Diesel consumption	MWh	0	0	0	0	0	0	
CO2 emissions from steam consumption	tCO_2	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
CO2 emissions from electricity consumption	tCO_2	0	0	0	0	0	0	
CO2 emissions from diesel consumption	tCO_2	0	0	0	0	0	0	
Total CO2 emissions	tCO_2	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	

Company: Svilosa AD **Reference:** SVP-06

Efficiency Measure: Shift of production from pulp blocks to pulp sheets

PROJECT EMISSIONS		Year 2007	2008	2009	2010	2011	2012	Note
Total production	ton pulp	0	0	0	0	0	0	
Steam consumption from Power Plant	MWh	0	0	0	0	0	0	
Electricity consumption	MWh	0	0	0	0	0	0	
Diesel consumption	MWh	0	0	0	0	0	0	
CO2 emissions from steam consumption	tCO_2	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
CO2 emissions from electricity consumption	tCO_2	0	0	0	0	0	0	
CO2 emissions from diesel consumption	tCO_2	0	0	0	0	0	0	
Total CO2 emissions	tCO_2	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	

Company: Svilosa AD **Reference:** SVP-06

Efficiency Measure: Shift of production from pulp blocks to pulp sheets

EMISSIONS REDUCTION		Year 2007	2008	2009	2010	2011	2012	Note
Baseline scenario emission	tCO_2	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
Project scenario emission	tCO_2	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
Total project emission reduction	tCO_2	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	Total crediting period 2007-2012= #DIV/0!

Company: Svilosa AD **Reference:** SVP-CONS

Efficiency Measure: Total ERUs form Project Activity

		Year						
EMISSIONS REDUCTION		2007	2008	2009	2010	2011	2012	Note
Baseline scenario emission	tCO_2	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
Project scenario emission	tCO_2	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	
Total project emission reduction	tCO_2	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	Total crediting period 2007-2012= #DIV/0!