B.3.4 Assessment on Lighting

Paper Machine 10 mainly uses Fluorescent Lamp at its factory with wattage 36 watt and Mercury Lamp with wattage 250 W and 400 W. The lamp is located at every production area and also in office, as we can see in the table below.

	Lighting						
	Type	Watt	Qty	Total (W)	Operating Hours/Day (H)	Energy (kWh/Year)	Lumen (Lux)
Office 1st Floor							
MAINTENANCE SPARE PART WARE HOUSE	TL 36 W	36	12	432	24	3,784	105
TRAINING ROOM	TL 36 W	36	16	576	10	2,102	150
RUANG TAMU 2	TL 36 W	36	8	288	10	1,051	N/A
RUANG TAMU 1	TL 36 W	36	8	288	10	1,051	N/A
HALL	TL 36 W	36	28	1,008	10	3,679	135
S14	TL 36 W	36	1	36	10	131	N/A
S13	TL 36 W	36	1	36	10	131	N/A
SATPAM C25	TL 36 W	36	2	72	10	263	N/A
SATPAM C24	TL 36 W	36	2	72	10	263	N/A
TANGGA	TL 36 W	36	4	144	10	526	90
Office 2nd Floor							
QCS 3	TL 36 W	36	28	1,008	24	8,830	222
QCS 4	TL 36 W	36	28	1,008	24	8,830	173.0
OPR STAFF	TL 36 W	36	4	144	24	1,261	222
RUANG KA. BAG	TL 36 W	36	8	288	10	1,051	N/A
RUANG ADMINISTRASI	TL 36 W	36	44	1,584	10	5,782	150,9
HALL	TL 36 W	36	12	432	10	1,577	N/A
MEETING ROOM	TL 36 W	36	10	360	10	1,314	N/A
LIBRARY	TL 36 W	36	8	288	10	1,051	178.1
TOILET	TL 36 W	36	8	288	24	2,523	N/A
TANGGA	TL 18 W	18	4	72	10	263	N/A
Office 3rd Floor							
Ware House	TL 36 W	36	8	288	10	1,051	N/A
Electric/ Instr office	TL 36 W	36	18	648	24	5,676	127

laborat	TL 36 W	36	12	432	10	1,577	106
Qualty Control	TL 36 W	36	32	1,152	10	4,205	120
Computer / efficiency	TL 36 W	36	44	1,584	10	5,782	160
Hall	TL 36 W	36	34	1,224	10	4,468	105
Mushola	TL 36 W	36	4	144	24	1,261	96
Tool Room	TL 36 W	36	4	144	10	526	85
Locker SPV	TL 36 W	36	6	216	10	788	105
Toilet	TL 36 W	36	6	216	24	1,892	97
Production							
Production 1st Fl	Mercury 250 W	250	3	750	24	6,570	75
	Mercury 400 W	400	50	20,000	24	175,200	105
Production 2nd Fl	Mercury 250 W	250	15	3,750	12	16,425	65
	Mercury 400 W	400	5	2,000	12	8,760	110
TOTAL			477	40,972		279,645	

Analysis:

From the table above, annual energy consumption is 279,645 kWh/year.

Potential saving for lighting :

- Electronic ballast can be installed to replace inductive ballast. Electronic ballast can save 15 % of lamp energy.
- LED can save 75% energy by replacing mercury 250 W with HDK Industry LED 50 W, and mercury 400 W with HDK Industry LED 100 W

Type of Lamp	= Fluorescent (TL) 36 W
Qty	= 404
Energy consumption	= 72,690 kWh/year
Potential saving	Replacement inductive ballast with electronic ballast, can save 15%.
Energy saving	= 10,904 kWh/year

Cost saving	= 10,904 x 0.075 USD/kWh
	= 817.77 USD
Investment	Price of electronic ballast is 2.5 USD, therefore 404 lamps required 1010 USD
Payback period	= 1.25 years

Type of Lamp	= Mercury 250 W
Qty	= 18
Energy consumption	= 22,995 kWh/year
Potential saving	Replacement mercury lamp 250 watt with HDK Industry LED 50 W
Energy saving	= 18,396 kWh/year
Cost saving	= 18,396 x 0.075 USD/kWh
	= 1,379 USD
Investment	Price of HDK LED 50 W is 175 - 225 USD, therefore 18 lamps required 3,150 – 4,000 USD
Payback period	= 2.3 years to 3 years

*. HDK Industry LED 50 W price obtained from market price. For the selection of LED should be reviewed further.

Type of Lamp	= Mercury 400 W
Qty	= 55
Energy consumption	= 183,960 kWh/year
Potential saving	Replacement mercury lamp 400 watt with HDK Industry LED 100 W
Energy saving	= 137,970 kWh/year
Cost saving	= 137,970 x 0.075 USD/kWh
	= 10,347 USD
Investment	Price of HDK Industry LED 100W is 350 - 425 USD, therefore 55 lamps required 19,250 – 23,375 USD
Payback period	= 1.9 – 2.3 years

*. HDK Industry LED 100 W price obtained from market price. For the selection of LED should be reviewed further.