**Energy Consumption by Sparsa Pad Factory**

In our pad factory, we have installed a 25 KVA three-phase electricity supply. For the connection, we had to apply through NEA (Nepal Electricity Authority), and after completing the necessary procedures, they installed the meter board in the factory.

Before deciding on the required KVA, it's important to calculate the total electrical load of the machines and equipment you plan to use. **Below is the load calculation for our factory.**

When hiring consultants to design your factory, they can also prepare the electrical connection diagram. For this, it's essential to know the location of each machine, the number of plug points required for each, and whether the machine requires single-phase or three-phase power. Based on this information, an electrical circuit diagram can be created.

It's also beneficial if your factory is located near a transformer installed by the electricity authority, as it ensures a more stable and regulated voltage supply. Otherwise, you may need to install a dedicated transformer for your factory.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **S.N.** | **Equipment/Machine** | **Qty** | **Power per Unit (kW)** | **Total Load (kW)** | **Load Hours(h)** | **Total Load per day (KWh)** | **Phase Required** |
| 1 | Paper Shredder Machine | 1 | 2.3 | 2.3 | 2 | 4.6 | 1 Phase |
| 2 | Mattress Absorbent Core Making Machine | 1 set |   |   |   |  |   |
|  | **Each component involved**  |   |   |  |   |  |   |
|  | Shredded paper feeding unit | 1 | 2.3 | 2.3 | 8 | 18.4 | 3 phases |
|  | Pulverize to make paper into fluff | 1 | 2.3 | 2.3 | 8 | 18.4 | 3 phases |
|  | Fluff sheet making and cutting conveyor | 1 | 0.75 | 0.75 | 8 | 6 | 3 phases |
|  | Core cutting and shaping unit | 1 | 0.3 | 0.3 | 8 | 2.4 | 3 phases |
|  | Suction unit- fluff waste collection | 1 | 2.2 | 2.2 | 8 | 17.6 | 3 phases |
|  | Air Compressor (running around 25 min per hrs.) | 1 | 7.5 | 7.5 | 3 | 22.5 | 3 phases |
| 3 | Layer Assembly Machine | 1 | 2.3 | 2.3 | 8 | 18.4 | 1 phase |
| 4 | Absorbent Core Feeding conveyor | 1 | 1 | 1 | 8 | 8 | 1 phase |
| 5 | Ultrasonic Generator | 1 | 1 | 1 | 8 | 8 | 1 phase |
| 6 | UV Disinfection Chamber | 1 | 0.6 | 0.6 | 8 | 4.8 | 1 phase |
| 7 | Pad packaging sealer | 2 | 0.2 | 0.4 | 8 | 3.2 | 1 phase |
| 8 | Air Conditioner | 1 | 1.5 | 1.5 | 8 | 12 | 1 phase |
| 9 | Lighting and General Utilities | - | 0.5 | 0.5 | 6 | 3 | 1 phase |
| 10 | Office Equipment (2 Computers, Fan, Printer) | - | 0.5 | 0.5 | 6 | 3 | 1 phase |

**Calculations:**
From the above table, the total power requirement for the entire factory is **25.115 kW**.
To convert this into KVA, considering a power factor of 0.85:
**Load in KVA = 25.115 / 0.85 = 29.55 KVA**

Our factory also has a solar power system installed, which generates approximately **11.52 kWh** of nominal power.

we cannot supply power to all machines using solar energy alone. However, excluding the absorbent core making machine, we can supply power to the remaining systems.

The installed solar power system (Batteries, Battery management system, Inverter, and power supply) is from **RCT Power**, a German brand, and the solar panels are from **Citizen Solar**, an Indian brand.

**Below you will find the technical specifications of the solar system we are using now**

**Batteries power storage capacity**

|  |  |
| --- | --- |
| **Category** | **Specification** |
| *Nominal Capacity* | 11.52 kWh |
| *Usable Capacity* | 10.37 kWh (90% DoD) |
| *Cycle Life* | 5000 cycles (at 80% remaining capacity) |
| *Voltage Range* | 360 V ... 520 V |
| *Nominal Voltage* | 461 V |
| *Max Charge/Discharge* | 25 A / 25 A |
| *Standby Consumption* | < 5 W |
| *Power Storage Interface* | CAN |
| *Battery Technology* | LiFePO₄ |
| *Dimensions (HxWxD)* | 1520 × 340 × 340 mm |
| *Weight* | 150 kg |
| *Battery Units* | 6 |
| *IP Protection* | IP42 |
| *Installation Type* | Floor stand / indoor |
| *Operating Temp Range* | +5°C to +40°C |

**Solar Panel Technical Specifications**

|  |  |
| --- | --- |
| **Parameter** | **Value** |
| *Model Number* | CSPL\_545 |
| *Nominal Maximum Power (Pmax)* | 545 Wp |
| *Module Efficiency* | 21.12% |
| *Open Circuit Voltage (Voc)* | 49.48 V |
| *Short Circuit Current (Isc)* | 13.75 A |
| *Operating Voltage (Vmp)* | 41.55 V |
| *Operating Current (Imp)* | 13.12 A |
| *Power Tolerance* | 0 to +2% |
| *Cell Type* | Mono-crystalline, 144 cells |
| *Dimensions (L×W×H)* | 2278 × 1133 × 35 mm |
| *Weight* | ~28 kg |
| *Maximum System Voltage* | 1500 V DC |
| *Series Fuse Rating* | 25 A |

|  |
| --- |
| **28-panel connection and its output** |
| **Configuration** | **Description** |
| *Panels in Total* | 28 (2 strings of 14 panels in series) |
| *Connection Type* | 2 × (14 panels in series), likely parallel combined |
| *Series Voltage (14 × Vmp)* | 14 × 41.55 V = **581.7 V** |
| *String Current* | Same as one panel: **13.12 A** (in parallel) |
| *Combined Current (2 strings)* | 13.12 A × 2 = **~26.24 A** |
| *Total Power Output* | 28 × 545 W = **15.26 kW (DC)** |

 **Technical Specification of Power Storage DC 10 (Inverter)**

|  |  |
| --- | --- |
| **Category** | **Specification** |
| **Type** | DC-coupled hybrid inverter |
| **Maximum Recommended DC Power** | 13.5 kW (South) / 15 kW (East-West) |
| **MPPT Inputs** | 2 (can be paralleled) |
| **Max DC Current per MPPT** | 14 A (28 A in parallel mode) |
| **Max Short Circuit Current** | 18 A (36 A in parallel mode) |
| **Rated DC Voltage** | 700 V |
| **DC Voltage Range** | 140 V – 1000 V |
| **MPP Voltage Range** | 380 V – 800 V |
| **Max DC Voltage** | 1000 V |
| **DC Start-Up Voltage** | 150 V |
| **Battery Input Voltage Range** | 120 V – 600 V |
| **Max Battery Charge/Discharge Current** | 25 A / 25 A |
|  |  |
| **Parameter** | **Value** |
| **Real AC Output Power** | 9900 W |
| **Max Apparent Power** | 10,500 VA |
| **Nominal AC Current/Phase** | 14.5 A |
| **Max AC Current/Phase** | 15.2 A |
| **AC Voltage (Nominal)** | 230V / 400V (3-phase: L1, L2, L3, N, PE) |
| **AC Voltage Range** | 180 V – 290 V |
| **Frequency** | 50/60 Hz (range: 45–65 Hz) |
| **Power Factor (cos φ)** | 1 (adjustable: 0.8 cap...0.8 ind) |
|  |  |
| **Feature** | **Details** |
| **IP Rating** | IP42 (indoor use) |
| **Operating Temperature** | -25°C to +60°C (derated above 40°C) |
| **Max Altitude** | 2000 m |
| **Noise Level** | < 35 dB |
| **Dimensions (HxWxD)** | 570 × 585 × 200 mm |
| **Weight** | 32 kg |
| **Communication** | WLAN, LAN, RS485, Digital In/Out, Dry Contact |
| **Warranty** | 10 years |