Article 9 Table 4

Best Available Techniques for Semiconductor or Panel Industry Process Technology Items

Energy users in the semiconductor or panel industries shall comply with the contents and efficiency values of the process technology items related to energy efficiency listed in the Best Available Techniques for the same industries below.

I. The best available techniques that the semi-conductor process technology items should meet

Best Available Techniques for Semiconductor Industry Process Technology Items	
(1)	Energy-saving design of tools. For the system side [such as vacuum pumps, local scrubbers, chillers, heaters, exhausts, compressed dry air (CDA), ultrapure water, gas supply equipment], proposing energy-saving design solutions related to the tool system side (e.g. pressure loss, pipe diameter design, temperature difference, exhaust gas treatment using energy-saving intelligent control) or explaining the selection of a highly energy efficient tool.
(2)	Adoption of highly efficient tool components: The tool components are energy-efficient products or conform to the latest international norms for energy-saving facilities; and see the following examples for the relevant energy-saving component items : 1. Using energy-efficient products (e.g. CNS 14400 IE3 class or higher) for motors with high power (single item or total) or long operating hours. 2. Adopting variable frequency control for electrical facilities. (such as pumps additionally installed with variable frequency devices or energy-saving regulators, etc.) 3. High efficiency RF Generators. (power supply specification capacity should match the load of the RF Generators to avoid excessive design) 4. UPS with an energy-saving mode control function. 5. High efficiency heat exchangers. (e.g. low pressure loss or large temperature difference) 6. Choosing energy-saving products if the process allows, or providing proof of energy saving efficacy. (meeting or exceeding the latest energy efficiency standards in the past three years)

<table>
<tr>
<td>(3)</td>
<td>Tool resource control design:
1. For the selection of primary tools and auxiliary equipment, considering hardware and control design with energy-saving efficacy, such as various energy-saving designs and the standby mode.
2. Energy-saving optimization for process utility system: the consumption regulation design and management mechanism for exhaust, cooling, compressed air, inert gas (such as nitrogen), etc.</td>
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<td>(4)</td>
<td>Energy management system.
1. For large-scale electricity and heat-consuming utility equipment, such as water chiller units, air handing units and cooling towers (kW/CMM), pumps (kW/CMM), air compressors (kW/CMM), etc., an energy baseline for the energy efficiency of equipment should be established, and the energy efficiency of the equipment should be monitored on a continuous and real-time basis and its abnormalities should be managed to facilitate equipment maintenance or replacement, and keep the equipment in a state of high energy-efficient operation. Or the energy consumption value of related important energy-consuming equipment can be measured or estimated in reference to the SEMI S23 standard along with the establishment of the energy consumption baseline for the plant and explanation of relevant energy-saving planning. For related equipment items, the following table can be considered for reference:
<table>
<tr><td>(1)Exhaust</td><td colspan="2">(6)Water cooled by cooling-tower</td></tr>
<tr><td>(2)Vacuum</td><td colspan="2">(7)UPW or DIW (Temp. < 25˚C)</td></tr>
<tr><td>(3)CDA</td><td colspan="2">(8)Hot UPW or DIW (Temp. > 85˚C)</td></tr>
<tr><td rowspan="2">(4)High pressure CDA
(827~1034 kPa gauge)</td><td rowspan="2">(9)Heat load</td><td>Heat removal via air</td></tr>
<tr><td>Heat removal via water</td></tr>
<tr><td>(5)Water cooled by
refrigeration (ΔT = 5˚C)</td><td colspan="2">(10)N_2</td></tr>
</table>
2. The energy management system can be used to manage the consumption percentages and energy-saving status of all kinds of energy.</td>
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(5)	Process technology energy use intensity. The process technology for products under 6 inches and 8-inch products must meet the top 10% (Top 10) energy use intensity benchmark values, as indicated in the table below:

Unit: KWh/Silicon Wafer Area—Square Centimeter

	Under 6 Inches Note 1	8 Inches Note 2
Energy use intensity	0.47	0.69

Note 1: Applicable to 6-inch products with 14 or less mask layers on average

Note 2: Applicable to 8-inch products with 15 or less mask layers on average

Note 3: If the average number of 6-inch mask layers exceeds 14, or the average number of 8-inch mask layers exceeds 15, or if the applicant is not compliant due to legal restrictions, patent protection, international trade barriers, or other factors not attributable to the applicant, the applicant is not subject to such restrictions after supporting materials are submitted.

Note 4: Energy use intensity calculation formula:

$$Energy\ Use\ Intensity = \frac{\text{Annual Power Consumption (KWh)by the Same Single Dimension Process of the Fab}}{\text{Annual Silicon Wafer Output Area (Square Centimeter) under the Same Single Dimension Process}}$$

The above annual production area of silicon wafers under the same single dimension process is calculated by the formula: $\pi \times r^2 \times$ the number of wafer slices (slices), where π is 3.1415926 and r is the radius of the silicon wafer (cm).

II. Best Available Techniques Which Shall Be Applied in Processing Techniques for Panel Industries

The Best Available Techniques for Panel Industries	
(1)	<u>Selection of Ancillary Devices for Equipment:</u> (1) Assess its energy efficiency as much as possible. (2) Adopt a higher energy efficiency or variable frequency controller (such as the pump installed on equipment with a variable frequency drive or an energy saving device, etc.).
(2)	<u>Energy-Saving Design:</u> The devices for equipment shall conform to the following: (1) Idle mode with the considered of energy saving; or alternative designs of energy saving mode with the same function. (2) The corresponding software with automatic or manual control to perform the energy saving control of the energy consuming ancillary devices under the standby mode such as a vacuum pump and an oven etc.
(3)	<u>Energy Usage Intensity of Processing Techniques:</u> The processing techniques for the plants of the 5th generation and before, as well as the 5.5th generation to 8th generation plants must follow to the top 10's (Top 10%)

benchmark of energy usage intensity which is shown as below:

Unit: kilowatt hour/input glass substrate area m²

	5th Generation and before Plant(1)	The 5.5th Generation Plant to the 8th Generation Plant(1)
Energy Usage Intensity	148	110

Note 1：Applicable for the mask layer processing of amorphous LCD less than 5 PEP process, with the actual input capacity per month of both TFT-Array glass substrate and the color filter (CF) exceeded 120K (thousand pieces).

Note 2：Those due to the legitimation restrictions, patents protection, international trade barriers, or other causes not be attributable to the applicants, the given evidences should be submitted by the applicants.

Note 3：Equation for calculating energy usage intensity:

$$\text{Energy Usage Intensity} = \frac{\text{Annual electricity (kwh) used in the whole plant for an unique generation}}{\text{Annual quantity } (m^2) \text{ of glass substrate input for the unique generation}}$$

The previous annual input quantity of various sized glass substrate and color filters, are calculated by: color filter (m²/pc) × pieces of each size of glass substrate (piece).