FIBER OPTIC & SOLAR POWERED

TRAFFIC SIGN-BOARDS

Made with waterproof LED light source and fiber-optic light emitting technology of a high floodlight efficiency
FIBER OPTIC & SOLAR POWERED TRAFFIC SIGN-BOARDS

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1. Summary

1-1. Instruction & History
1-2. Purpose of Use
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1-1. Instruction & History

- OMNI SOLAR is a distributing company of the Sign-board which develops and supplies Lighting Road Safety Sign-boards. The Sign-board which uses stand-alone Solar panel.

2000 year
Developed and supplied

2006 year
Registered 3 patents
2007 Patent of Solar Street lamp
Patent of Solar LED Light bar

2010 year
Performance Certificate from *SMBA
Excellent Product from *PPS
2011 Registered a patent of internal lighting sign-board
2013 Designated New Traffic Technology 18th

2017 year
Excellent Product from *PPS

2004 year

2009 year
Patent of manufacturing

2015 year
Registered 2 Patents of manufacturing
Performance Certificate from *SMBA

*SMBA: Small and Medium Business Administration in S. Korea
*PPS: Public Procurement Service in S. Korea
1-2. Purpose of Use

- OMNI SOLAR SIGN BOARD is used on night or day roads with decreased visibility and perceptivity.
- OMNI SOLAR SIGN BOARD delivers specific information/legends to drivers.
1-3. Necessity

- It has been proved that the effects legibility of existing reflective sign-board at night for a long time.
- But the surface can be damaged, which decrease visibility and affect the weather (diffused reflection).

‘The need for more distinct, high communicable road signs’
1-4. Components

[ Components of FOSS]
2. Technology & Efficiency

2-1. Current State of Technology

2-2. Technology
2-1. Current State of Technology

- Product safety
- Stability of electromagnetic waves
- New Traffic Technology (NET) 18th from MOLTI
- Excellent Product from *PPS
- Performance Certificate from *SMBA
- Korean World-class Product from Minister of Trade, Industry & Energy
- Patents of FOSS
- Patents of applied products using Solar & LED
- Test Certificate from KOROAD
- Test Certificate from State-authorized Institution

*SMBA: Small and Medium Business Administration in Korea  *PPS: Public Procurement Service in Korea
2-2. Technology of Product / Core Technology of FOSS

Solar Module Optimization
- Working ability for 20 days or more charging 4 hours a day
- LED Minimization with LED Optimum Design
- Low-powered, High-luminance

Emitting Quality
- Clear lighting without glaring and blurring
- Conspicuity / Visibility / Legibility for drivers
- Special Technology difference from Commercial Sign

Durability & Stability
- Waterproof & Dustproof grade
- Performance during its original period without trouble
- Warranty for 5 years

Easy Maintenance
- Maintenance in the field without removing
- Checking Box of LED Unit
- Independent structure of Control Box
2-2. Technology of Product / Core Technology / Control Flow

- Solar Panel (Electricity)
- Controller
- Battery
  - Over-charge reward
  - Over-discharge Prevention
- LED
- Fiber-Optical (Transportation)
- Emitting Surface

Day
- Charging
- Electricity Control

Night
- 80

- Keeping equally brightness through Control of PWM & Electricity
- Dimming Design considering background Illumination of Sunrise/Sunset
- 20 Sunless days according to low power
- Working Algorithm with know-how for over 15 years
2-2. Technology of Product / Core Technology / Emitting Quality

- Fiber-optical: Using total reflection of light, has low light loss and not affected by being outdoors.
- It provides clear traffic information despite serious pollution because it has low surface distortion from emitting pixel.
- These effects of Fiber-optics provide excellent legibility, visibility, readability for drivers.

[ Feature of Fiber-optical: Mimetic Diagram of Total reflection and Curve structure ]
2-2. Technology of Product / Core Technology / Emitting Quality / Efficiency comparison

OMNI SOLAR 90%

High Efficiency

Internal Lighting 29%

Low Efficiency

LED Guide Panel Reflective Sheet Retroreflective Sheet

<table>
<thead>
<tr>
<th>LED</th>
<th>Guide Panel</th>
<th>Reflective Sheet</th>
<th>Retro-reflective sheet</th>
</tr>
</thead>
<tbody>
<tr>
<td>100%</td>
<td>54%</td>
<td>49%</td>
<td>29%</td>
</tr>
</tbody>
</table>

2. Technology & Efficiency

- OMNI SOLAR: 90% Efficiency
- Internal Lighting: 29% Efficiency
- Low Efficiency: Various components (LED, Guide Panel, Reflective Sheet, Retroreflective Sheet)

Diagram showing the components and their efficiencies.
### 2-2. Technology / Core Technology / Durability and Stability

<table>
<thead>
<tr>
<th>Item</th>
<th>OMNI SOLAR SIGN BOARD</th>
<th>Internal Lighting</th>
<th>LED Lighting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dustproof</td>
<td>Best grade IP 6</td>
<td>NO GRADE</td>
<td></td>
</tr>
<tr>
<td>Waterproof</td>
<td>Best grade IP 8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impact</td>
<td>Best level IK10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electricity Safety</td>
<td>No electrical Install</td>
<td>Shock Hazard using commercial electricity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Free from electric sh</td>
<td>Need Education of Safety of Electricity to Drivers and Workers</td>
<td></td>
</tr>
<tr>
<td>Remarks</td>
<td>Pass Performance Test (A total of 16)</td>
<td>Test of the basic List</td>
<td>No standard</td>
</tr>
<tr>
<td>Image</td>
<td><img src="image1.png" alt="Image" /></td>
<td><img src="image2.png" alt="Image" /></td>
<td><img src="image3.png" alt="Image" /></td>
</tr>
</tbody>
</table>
2-2. Technology / Core Technology / **Waterproof LED & Impact resistance Design**

- Application of flexible Fiber-Optic
- Waterproof structure LED & Impact Resistance Design
  (FOSS works without electrical short even if rainwater flows in the inside)

Normal operation even in case of damage from collision (High Durability)
2-2. Technology / Core Technology / Durability and Stability / Core Patent Technology-LED Unit

Assembled injection molding
(Excellent ability for Waterproof, Dustproof)

Shock relief Softness
(Excellent ability for impact resistance)

Streamlined manufacturing process and reduced production cost due to high durability and simple light source combination structure
2-2. Technology / Core Technology / **Maintenance**

- **Focus structure of checking box for the bundle of Fiber-Optic and LED**
  It is possible to replace LED simply.

- **Stand-alone of Control box**
  It is easy to check the circuit and change the battery.

- **Perfect handling in the field**
  All works regarding maintenance completes in 30 minutes without removing Sign-board.
3. Economy

3-1. Marketability
3-2. Utilizing supply
3-3. Advanced Technology
3-1. Marketability

- Global Trend of using lightened Sign-boards
- **OMNI SOLAR SIGN BOARD** is gaining foothold in the market with its technological and economic benefits.
- Positive overseas export projection with increased global attention on protecting lives and properties.

‘High export performance and growth are expected if a successful localization strategy is applied.’
3-2. Utilizing Supply

Move to a high-added value area by combining state-of-the-are technologies
3-3. Advanced Technology

Competitiveness of Innovations in Technology

A. Designed to endure hot, dry weather
   Heat-resistance / Heating Control / Long-life
   Operating a special test bed for hot, dry weather in Qatar

B. Remote Check, Enterprise Management System
   Real time monitoring of failure and maintenance using wireless communication
   Tailored data generation & Communications infrastructure

C. Equipped with high-tech Sensors
   Sensor of changing for Weather, Traffic, Road
   Dynamic light emission motion and patterns linked with pattern analysis of risk-factor like smog, gridlock, road
3-3. Advanced Technology / Design for hot, dry weather/ Heat-Resistance Components

- **BODY**: UV Fiber-Optic Holder + Heat-Resistance Plastic Fiber-Optic
- **Controller**: Automotive element → ST Micro MCU, MLCC Capacitor (-40°C ~ 125°C)
- **Battery**: Lithium Battery → Stability in heating environment without explosion
3-3. Advanced Technology / Design for hot, dry weather / **Heating Control System**

- **LED Unit**: Design for Triple LED PCB → minimized load distribution, current consumption
- **Controller**: Constant current control circuit + LED Driver IC in Heating Sensor

<table>
<thead>
<tr>
<th>Triple Light Unit</th>
<th>Constant Current Control by Feedback Loop Amplifier Circuit</th>
<th>Heat Control Switch-Embedded BJT</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="LED arrangement" /></td>
<td><img src="image2" alt="Feedback Loop Amplifier Circuit" /></td>
<td><img src="image3" alt="Heat Control Switch-Embedded BJT" /></td>
</tr>
</tbody>
</table>

"3 Group LED Working 1/3 power consumption minimize heat"
→ Alternative Current Control and heat dissipating in case of excessive current

"Analog Current Control using OP-AMP"
→ Improvement of real time response for overcurrent
→ Minimized heat-damage LED

22% Improvement of power consumption from heating contrast with existing single BJT element
3-3. Advanced Technology / Design for hot, dry weather/ **Long-Life System**

- **LED Unit**: Low-powered LED → Use 10% in comparison with rating power consumption
  Extended life cycle by minimizing heat shock of LED
- **Battery**: Dual System → Auto Control of conversion between charge and discharge
  Removal for wastage of unnecessary cycle

‘Warranty for LED 10Years, Battery 5years’

<table>
<thead>
<tr>
<th>Low Power Consumption LED</th>
<th>Dual Battery</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Temperature rise according to increasing power consumption of LED</td>
<td></td>
</tr>
<tr>
<td>- Reducing life when Junction temperature rises</td>
<td></td>
</tr>
<tr>
<td>- Changeover switch for Discharge 1 day and Charge 1 day</td>
<td></td>
</tr>
<tr>
<td>- Cycle of Once every two days</td>
<td></td>
</tr>
<tr>
<td>- Standard for LiFePO4 2,000 Cycle : working for 4,000 days (10.9yrs)</td>
<td></td>
</tr>
<tr>
<td>- Standard for LiFePO4 3,000 Cycle : working for 6,000 days (16.4yrs)</td>
<td></td>
</tr>
</tbody>
</table>

![Graph showing lifetime vs junction temperature](image)
3-3. Advanced Technology / Designed for hot, dry weather

- It is designed for hot, dry weather based on Data.
3-3. Advanced Technology / Remote Check, Enterprise Management System

- Real time monitoring of failure and maintenance using wireless communication
- Provide various special extensions for IoT device → Tailored data generation/ Communications Infra

Expandability

- Patrol Car
- Wireless Communication
- Controller
- Self Repairing Control
  - LED Failure
  - Battery Condition
  - Temperature

Monitoring Devices
- Computer
- Mobile Device
3-3. Advanced Technology / Equipped with high-tech Sensors

- Equipped with high-tech Sensors for changing of Weather, Traffic, Road
- Dynamic light emission motion and patterns linked with pattern analysis of risk-factor like smog, gridlock, road.

### ‘Key Point for road traffic Safety’

<table>
<thead>
<tr>
<th>Climate Sensors</th>
<th>Traffic Information Transponder</th>
<th>Road Hazards Detector</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Climate Sensors" /></td>
<td><img src="image" alt="Traffic Information Transponder" /></td>
<td><img src="image" alt="Road Hazards Detector" /></td>
</tr>
<tr>
<td>“Smog sensor”</td>
<td>“Transmission and receiving of information of traffic congestion and accidents”</td>
<td>“Sensor for risk-factor of Dropping and Road”</td>
</tr>
<tr>
<td>→ Automatic emitting ahead of SMOG</td>
<td>→ Detour guidance in case of accident, Colored information on traffic jam</td>
<td>→ Providing information ahead of dangerous things</td>
</tr>
</tbody>
</table>
4. Applications

4-1. Comparison
4-2. References of Installation
4-3. Custom-Made
4-1. Comparison: OMNI Solar Sign Board In Foul Weather
(No electricity, Storm, Heavy Rain, Tornado)

In Good Weather]

[In Bad Weather]
4-1. Comparison: Normal Reflective Sign board VS OMNI Solar Sign Board

[Reflective Sign Board]  [OMNI SOLAR Sign Board]
4-2. References of Installation

[OMNI SOLAR SIGN BOARD]

![Sign Board Images]

- CAUTION
- Glenwood Lenoxville 2 MILES
- DO NOT ENTER
- Roundabout Sign
4-2. References of Installation

[OMNI SOLAR SIGN BOARD]
4-3. Custom-Made: Any Design, Any Text

[OMNI SOLAR SIGN BOARD]
THANK YOU!

ALL PICTURES SHOWN ARE FOR ILLUSTRATION PURPOSE ONLY. ACTUAL PRODUCT MAY VARY DUE TO PRODUCT ENHANCEMENT.