OSi's Optical Weather Instrument Lineage

Unlike other vendors who make extravagant claims of their sensor's capabilities and present their own in-house data to support them, OSi has a real track record in varied environments and markets to fully prove our performance claims. Our claims are derived from actual field performance and from extensive data collected primarily at airports and government test facilities, including the NWS Test & Evaluation Facility in Sterling, Virginia. Product improvement is based on real-life experience gained in the field. Designed for rugged, unattended operation, more than 5000 OSi optical weather instruments have been field proven in adverse environments around the world on every continent in the world, including Antarctica. As of 2018, OSi has accumulated more than 600 million unit-hours of field experience with our optical precipitation sensors! That figure far exceeds the experience of all other present weather sensor vendors combined! OSi has executed over 30 optical sensing projects since 1985 and has pooled its resources to assemble a uniquely qualified team with all the requisite support skills. Optical sensing of environmental parameters is not a sideline for us – it is our core business. The high degree to which we meet and exceed our customer's needs is reflected by this.

The current NWS Automated Surface Observing System (ASOS) present weather sensor, the Light-Emitting Diode Weather Identifier (LEDWI), was developed by OSi (then Scientific Technology Inc.) in the 1980's and became the key sensor in the ASOS. This sensor, fielded at over 1000 locations across the United States, continues to meet the original design requirements with a solid track record of high reliability. Most of these LEDWI are now over 25 years old and all are still operating in the field – a testimony to OSi's design and production philosophy and capabilities! The capability of LEDWI to differentiate between rain and snow is unmatched by any other sensor or technology. The LEDWI does however have limited drizzle detection sensitivity and limited ability to properly identify hail and ice pellets. With increased concerns over more accurate detection and quick response to all types of hazardous weather, the need for reporting precipitation parameters beyond the original specification has continued to develop.

At the beginning of the ASOS acquisition phase, the design of the LEDWI was frozen for the ASOS application requirements at that time. Various measures to enhance the sensor to meet the new requirements were pursued both in-house and with NWS funding. OSi continued to improve on the original sensor in-house with the development of a commercial series of present weather and combined present weather/visibility sensors – the OWI-120 Optical Weather Identifier and the OWI-240 Weather Identifier and Visibility Sensor. In addition, an acoustic add-on sensor was developed to add hail and ice pellet detection capability to the LEDWI, OWI and WIVIS. Through the use of hardware design optimization and newer software techniques for algorithm development, OSi has greatly enhanced the commercial sensor's detection sensitivity as well as accuracy. With the asymmetric packaging of the optical head for the second generation series of OWI / WIVIS sensors, the susceptibility of the LEDWI to wind-induced vibration was overcome as well. More than 3500 of these sensors have found widespread use in highway, airport, commercial and international applications.

At the turn of the century, OSi committed to developing the third generation of present weather / visibility sensor, based on all digital electronics. In 2005, the DSP-WIVIS (OWI-430) was released. This third generation sensor has at its core a high speed Digital Signal Processor (DSP) that replaces the previous sensors' analog electronics enclosure. All of the processing electronics are now contained in the head which greatly simplifies maintenance and installation. The DSP-WIVIS implements the basic architecture and analog circuitry of the WIVIS in a high-performance single-board DSP engine. This approach has been well proven and is now commonplace in a wide array of electronic equipment and sensors, including test equipment, avionics gear, and a host of consumer electronics products. Whereas earlier generation sensor required periodic field calibrations (which were difficult to do during extreme heat or cold), the new DSP based sensors have virtually eliminated temperature sensitivity and have no trimpots or variable components to adjust.

The DSP-WIVIS combines the original in-beam scintillation technology used in LEDWI with the addition of an off-axis optical forward scatter channel. It is known that optical forward scattering is sensitive to small particles such as fog or drizzle. By combining the in-beam scintillation and the off-axis forward scattering, the DSP-WIVIS is much more sensitive to drizzle than the first and second generation sensors and in addition, adds visibility measurement capability. Firmware updates are now done by software upload over the serial port. Nearly 2000 of these third generation sensors have been fielded to date. Through these and other enhancements, OSi has been able to produce a new generation of present weather sensors that greatly improves on the versatility and accuracy of the earlier ASOS LEDWI and commercial OWI. With the optional Hail and Ice Pellet Sensor add-on, the DSP-WIVIS / HIPS combination can report nearly every published NWS and WMO weather code.

The Mini-WIVIS (OWI-650) incorporates the same architecture of the DSP-WIVIS on a faster yet lower power DSP engine. By utilizing an intermittent power-up mode of operation and tuning the algorithms to handle the non-continuous operating mode, the Mini-WIVIS puts all the power of the DSP-WIVIS into a much smaller / lighter package that can be battery operated and more easily field deployed. These features and the optimized algorithms yield a sensor that provides the highest degree of accuracy, versatility and reliability possible, to date.

Please note that throughout this document and other OSI reports and performance verification data, any graphs, data, specifications, or other references to the OSi LEDWI / OWI / WIVIS and DSP-WIVIS very closely apply to the Mini-WIVIS, which as the latest DSP-based sensor utilizes the same virtual hardware architecture and basic firmware algorithms, with sequentially further enhancements through fine tuning of the advanced weather algorithms and the hardware. With each generation of sensor, all of the performance specifications have either remained the same or in most case, have been improved.

There have been a few newcomers to the present-weather sensor market in the past five or ten years. While it is possible save a few dollars on one of these newcomers, you will not be able to find better performance and reliability. OSi has always been very conservative in our published specifications but the same is not necessarily true for the competition. With algorithms based on over 600 million unit-hours of field data, it is impossible to find a better solution to your visibility, precipitation and present weather sensing needs!