

NV5 STAYS ON LEADING EDGE IN ACQUIRING DRONE SERVICES FIRM SKYSCENE AND BUILDING OPTIMIZER ENERGENZ

NV5 Global, Inc. is a provider of professional and technical engineering and consulting solutions ranked #45 in the Engineering News Record Top 500 Design Firms list. NV5 serves public and private sector clients in the infrastructure, energy, construction, real estate and environmental markets. NV5 primarily focuses on five business verticals: construction quality assurance, infrastructure engineering and support services, energy, program management, and environmental solutions. The Company operates out of more than 100 locations nationwide and abroad in Macau, Hong Kong, and the UAE. Since its inception in 2009, NV5 has grown into a client focused consulting firm with \$500M in annual revenues. The firm's growth has been accomplished through a combination of strategic acquisitions and organic growth with a focus on cross-selling services throughout the NV5 platform.

Scott Kvandal serves as Chief Synergy Officer of NV5. He has over thirty years of experience in the infrastructure engineering industry. Most recently, Mr. Kvandal was Chief Operating Officer of the Western Region of Bureau Veritas North America, where he grew the firm to national leader in code compliance and operating revenue within his group to \$120 million. Before joining Bureau Veritas, Scott was President of Berryman & Henigar, and earlier, he served as President of Barrett Consulting Group. As Chief Synergy Officer of NV5, Scott is responsible for enhancing the cross-selling of services between the firm's five business verticals leading to accelerated organic growth.

EBJ: Which are the key technology solutions that NV5 provides? How is technology changing the way that NV5 operates?

Kvandal: NV5 is continually seeking ways to enhance the value of services provided to our clients through new and evolving technologies. Two new technologies that NV5 has incorporated into the delivery of our service offerings is the use of Unmanned Aerial Vehicles (UAVs), commonly referred to as "drones" and our energy management and sustainability services through the recent acquisition of Energenz by NV5.

USING UAVS WITH ADVANCED SCANNING EQUIPMENT

Entry-level UAV applications are useful in taking pictures and videos. However, a completely different level of expertise, technology and equipment are required for creation of full planimetric drawings or

full engineering-grade topographic maps with surfaces and mark-outs. The substantial technology investment, experience and commitment are simply beyond the in-house capabilities and resources of most organizations.

Our UAV division provides aerial mapping using LiDAR and digital imagery. These different but complimentary datasets are often used in conjunction to produce planimetrics, topographical maps, 3D surfaces with break lines and contours, as well as overhead and underground utility mapping and design. We operate UAVs that carry highly sophisticated equipment on board; for example, a survey-grade LiDAR scanner and IMU (Inertial Measurement Unit), thermal cameras, multi-spectral cameras and cameras designed for stereo collection for photogrammetry.

Terrestrial (land-based) and manned aircraft LiDAR has been in use for a number of years, but until recently, the technol-

ogy for acquiring LiDAR data from UAVs has been unavailable.

UAV data collection is performed by our highly trained and certified pilots. They set up NV5's state-of-the art equipment and operate it correctly, following safety guidelines out in the field while working near high tension lines, power lines and transmission poles. Each system is equipped with an onboard Global Navigation Satellite System (GNSS) receiver, which is used to create a post-processed trajectory when paired with a local base station on the ground. Finally, data is tied down to, and checked against survey ground control to ensure that the accuracy standards for each project are being met.

We are committed to keeping up-to-date on accuracy standards, and often reference publications such as the United States Geological Survey's LiDAR Base Specification and the American Society for Photogrammetry and Remote Sensing's Accuracy Standards for Digital Geospatial Data.

ENERGENZ: TECHNOLOGY TO OPTIMIZE BUILDINGS

Today building lifecycle management is governed by two overriding missions: to keep energy efficiency at an all-time high and operating costs at an all-time low. However, in a world where physical infrastructures haven't quite kept pace with its digital counterparts, organizations are soon realizing the value proposition that resilient structures and energy-efficient buildings bring. Effective energy use goes far beyond motion-sensor lighting, and there is a real opportunity for improving the operational value of mechanical systems in a building. In such a scenario, Energenz is redefining efficiency in the built environment by diving deep into complicated mechanical systems to discover the hidden defects followed by quantifying and fixing those defects with controls optimization. Primarily an engineering consultancy, Energenz partners with clients to re-

duce operating costs in energy spend while improving the life of a building through environmentally safe measures.

Following a technology and data-driven approach, Energenz has a team of engineers that use software to carry out analytics on big data in order to monitor and continuously commission a building.

EBJ: How does NV5 differentiate from competitors from the technology standpoint?

UAV SERVICES

Some companies have their own in-house UAV group, but the capabilities are usually limited and not sufficient for engineering design. Building a substantial in-house UAV operation is not practical for most organizations. They might invest in the equipment only to realize they do not have the highly-experienced, dedicated staff or necessary training to provide quality UAV mapping services.

Even organizations with full aviation departments find it challenging to introduce UAVs into their operations. The associated expense for equipment and crews is often a barrier to entry.

Instead, it's more efficient and economically viable for companies to work with an experienced, full-service UAV mapping provider like NV5. We are invested in providing the best UAV mapping services by having a dependable UAV division. We employ full-time highly-trained licensed pilots, mapping staff and a management team that continually provide these services to clients and teaming partners.

MONITORING BASED COMMISSIONING (ENERGENZ)

Many of our competitors follow a traditional approach to optimizing buildings, a one-off type of assessment that looks at a snap shot of information from the building data and relies on physical inspections and manual spreadsheet based analysis by a team of engineers. This approach tends to be cyclical, initially energy savings are achieved and costs are decreased.

However, over time (12 – 36 months), the building will drift back to its original

state and the process will need to be carried out again.

Utilizing technology, Energenz connects to a building and continuously gathers thousands of data points at very granular time intervals. This not only allows us to do a much deeper dive into the opportunities for energy savings in a more efficient manner, it also enables us to continually monitor and further optimize the building over time. The end result is that we not only significantly reduce the energy costs within the building, we maintain these reductions over time.

EBJ: You acquired Skyscene about a year ago. Can you give us some background on the technologies that you acquired through Skyscene?

Kvandal: NV5 first began contracting Skyscene as a subconsultant for providing drones, licensed pilots, and UAV operational knowledge for existing NV5 projects. NV5 has an expansive survey department that has been using terrestrial LiDAR equipment for a number of years. Our power delivery energy clients have been requesting more detailed inspections of their electrical transmission and distribution facilities in which a survey grade LiDAR unit mounted on a UAV would provide. After some initial testing and verification of the accuracy in data collection, NV5 acquired Skyscene in 2017.

Many use a one-off assessment that looks at a snapshot of information from building data... Energenz connects to a building and continuously gathers thousands of data points.

The combination of NV5's expertise in the use of LiDAR scanning equipment and processing, combined with the experience and expertise in advanced UAV operations, has proven to be a powerful combination and has now become a differentiator in the marketplace.

EBJ: Can you provide an overview of the type of demand that this type of technologies have on an industry level?

UAV SERVICES

The uses for UAV services have been expanding both in nature and in volume as the industry becomes more aware of the potential applications. The demand and nature of UAV applications has continued

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to increase as we educate our current and future clients with the capabilities of using UAVs with a variety of technological sensors.

A few of the applications in highest demand include:

- **Inspections of power utility infrastructure**

With the use of UAV LiDAR technology, NV5 is not only able to provide detailed inspections of aerial facilities in a safe manner but also able to import the LiDAR data into PLS-CADD classification and design software. We are able to provide an entire, full-service solution to our clients from start to finish.

- **Mining Operations Support Services**

With the use of UAVs and remote sensors, NV5 is able to periodically map mining operations and quickly provide accurate measurements of mining volumes that cannot be provided using conventional surveying techniques.

- **Topographical Mapping thru Vegetation**

Because of the nature of LiDAR scanning, NV5 is able to map the surface topography through thick vegetation, for example, thru sugar cane fields. This cannot be performed using conventional surveying methods without clearing or damaging the vegetation.

- **Topographic Mapping**

Whereas using conventional surveying and use of manned aircraft for topographic mapping is commonplace today, we believe that UAV mapping will be the standardized delivery approach in the future. Our UAVs carry the same equipment on board as a manned aircraft, but UAVs can fly lower and slower, capturing denser, more accurate data.

- **Solar Farm Installations and Performance Monitoring**

In addition to providing the necessary topographic mapping required for the development of new photovoltaic solar, NV5 is able to use UAVs mounted with thermal cameras that can be used in conjunction

with specialized software applications to monitor the individual photovoltaic panels' performance. This ability not only provides owners to routinely evaluate their solar field's performance but gives them detailed information of panel performance that is otherwise necessary to be collected manually and thereby incurring extensive labor costs.

- **Commercial Roof-Mounted Photovoltaic Installations**

During the design process for a large roof mount (>1MW), a detailed roof plan is critical to maximizing system operation, permitting and safe operation of the project long-term. Traditionally, attaining a detailed roof plan requires a significant amount of time and investment comparing as-built drawings, online aerial imagery, and a detail site visit with multiple people actually pulling tape to locate features and validate dimensions. The high resolution imagery, LiDAR and other imaging technologies offered by NV5's UAVs cuts out a majority of that investment as we are able to provide a detailed roof plan from a single UAV flight with sufficient detailed imagery to ensure that return site visits are not required. Additionally, the collected data enables designers to optimize roof arrays with greater confidence to the real world shade profile throughout the day and year.

Finally, NV5's UAV group's rapid deployment and short lead time to turnaround final roof plan drawings saves time and money in the solar project's development cycle.

EBJ: Have the technology acquisitions had an impact in NV5's overall profits?

Kvandal: The acquisition of both Skyscene and Energenz have been accretive to NV5's earnings. With that said, the growth of these new technologies is somewhat buffered by the ability of our clients to understand (it requires an education) the technology, its ability to provide more accurate data and the value of the enhanced service offering. For instance, while the power and energy utilities have quickly embraced the use of UAV technologies, others like State Departments of Transportation have been more reluc-

tant to adopt the new technology. Often, we have provided a real test in the clients' use of conventional technology to that of using UAVs. The increased accuracy combined with a more cost-effective solution quickly becomes apparent, but it requires an education process.

We believe that we are a little ahead of industry's full acceptance... We want to be on the "leading edge", but not on the "bleeding edge" as we integrate new technologies.

EBJ: What was the main reason behind these acquisitions?

Kvandal: The main reason for the acquisitions was primarily responding to an identified need in the industry but, in the case of Skyscene, we were encouraged from one of our utility clients as they had a high demand for the service and were unable to develop the technology internally.

EBJ: Change and integration is always challenging. How have you been able to complement the services that you provide with these new technologies? What type of training did you provide to NV5's personnel regarding the new technology?

Kvandal: The integration of the technologies has been quite synergistic without too many challenges. The integration of new technologies, which have recognized to be of high value to our clients, has been embraced by our technical teams and client managers. The challenge in the case of UAV services, has been the speed at which we can train our staff in the efficient processing of data. For every hour of data collection flight time, there is typically one to two days of data processing time required by well-trained and experienced data processors.

As a team of engineers and consultants, we view the software and technology we use as a tool to provide value to our clients through our services. We invest significant time and effort into improving the tech-

nology in order to enhance these service offerings and deliver them more efficiently and cost effectively.

There have been opportunities to utilize the technology for other NV5 services such as commissioning, training is provided to the engineers within this business unit, so they can effectively utilize these tools to enhance their processes and differentiate from the competition.

EBJ: Why do you consider that the transaction was performed at the right time? How does it fit in your overall growth strategy?

Kvandal: We believe that we are a little ahead of industry's full acceptance of these new technologies. But, this is exactly where NV5 wants to be positioned. We want to be on the "leading edge", but not on the "bleeding edge" as we integrate new technologies. NV5 was well experienced in the use and application of terrestrial LiDAR. Combining the use of LiDAR with a drone was a natural next step technology.

NV5's tag line is "Delivering Solutions – Improving Lives". Part of our strategy is to incorporate new technologies into the delivering our solutions, i.e., Delivering Solutions – Thru Leading Technologies".

EBJ: Do you have in-house personnel devoted to technology related R&D?

Kvandal: NV5 does not have a team of personnel dedicated to developing new technologies. We believe the strategy of identifying new technologies developed in the industry and integrating them into our service offerings is a faster and more cost-effective solution for NV5.

EBJ: Will you consider acquiring additional technology related companies? Which are the technologies that you believe would be of high value to your organization and your clients?

Kvandal: We are looking into incorporating new technologies for use in the energy compliance regulations and sustainability as well as in the security of facilities and property.

EBJ: Are you currently using technology as a way of diversifying NV5's revenue streams into a more recurring or subscription-based revenue as opposed to the traditional project based, "time for money" model?

Kvandal: We like the recurring revenue model and believe our Energenz services are well-suited for the subscription-based

revenue model. We financially engage with our clients using a subscription-based model where we charge a monthly fee. This subscription-based revenue makes us extremely "sticky" with our clients. They literally see the NV5 logo in front of them every day. This not only positions us perfectly for additional services such as Commissioning and MEP design, we continue to have that long-term relationship with every client we sign up, this is so powerful in itself. As a large portion of this service is automated once we are set up, it also enables us to recognize revenue not tied to head count and achieve higher margins due to breakage, much like a Netflix account.

EBJ: How do you think that tech services M&A is driving growth in the environmental industry?

Kvandal: NV5 seeks to acquire new technologies in order to add value to our clients and differentiate our firm in the marketplace. □