Vol. 13, No. 1

Sustainability is Key at John Wayne Museum



**新闻**名

IGSHPA is an outreach unit of the OSU College of Engineering, Architecture and Technology

CEOULD UT CO The official publication of CESH

HN WAYN

JOHN WAYNE

BIRTHPLACE



## CONTENTS

### DEPARTMENTS

- 4 Geo Outlook Staff
- 6 IGSHPA Updates
- 8 Association Updates
- 10 Project Spotlight Sustainability is Key at John Wayne Museum By Dan Vastyan
- 42 Earth Insights

### **INDUSTRY INSIGHTS**

- 16 Thermal Grout & Pipe Buckling By Ryan Carda
- 22 Fiber Optic Based Distributed Temperature Sensing (DTS) for Large Geo Installations By Chuck Hammock, José Acuña, Brandon Caves & Axzel Seguera
- 28 Understanding Confined Space Standards for Well Drilling By Jerome Spear
- 32 It's About the Money! By Ed Lohrenz
- An Update on Sweden's Ground Source Heat
  Pumps
  By José Acuña



Sustainability is Key at John Wayne Museum



Fiber Optic Based Distributed Temperature Sensing (DTS) for Large Geo Installations



# **10** PROJECT SPOTLIGHT

Contraction of the

22/

JOHN WAYNE Born Marioe Robert Morrison In Winterset, Iowa May 26, 1907 Sculpture donated to the People of Madison County By the John Wayne Family STA.

JOHN WAYN



### Sustainability is Key at John Wayne Museum By Dan Vastyan

"Tomorrow hopes we have learned something from yesterday." - John Wayne

noum to many as "Duko" y

Known to many as "Duke", western film superstar John Wayne rode on to broader vistas in 1979, leaving a legacy rivalled by only a handful of Hollywood greats. From "True Grit" to "Chisum", "Hondo" to "Sands of Iwo Jima", Wayne's acting could only be described as natural.

The breadth and tenure of his career left much to be admired by fans young and old. In an attempt to collect and safeguard as much of that history as possible, the John Wayne Birthplace Society is adding a facility utilizing ground-source heat pump (GSHP) technology to the superstar's historic birthplace property.

On Memorial Day 2015, grand opening festivities were held at the new John Wayne Birthplace Museum, adjacent to Wayne's childhood home in Winterset, IA.

"This project has been talked about for 10 years," said the society's executive director, Brian Downes. "In 2008 we got serious and started planning. The society really needed a central location where John Wayne fans could come see memorabilia and to celebrate Wayne's accomplishments."

### Bowlegged and built to last

A thin strand of environmentalism sauntered through much of Wayne's career, perhaps most prominent in a scene out of "McLintock". Wayne's character, G.W. McLintock, speaks with his daughter about preserving the land he owns. One would have to guess, based on The Duke's love of wild spaces, that conserving natural resources for generations of Americans to come would be of interest were he still alive today.

Like the man himself, the museum also tips its hat to environmental sustainability. It's only fitting that the facility embodies Wayne and his career, architecturally and otherwise. The Southwestern-styled, 6,100 square-foot building is rugged, unembellished and built to last. Stone, stucco and a standing-seam metal roof wrap the ICF (insulated concrete form) structure, punctuated by glazed, argon-filled windows. Inside, Modine geothermal units coupled with Aprilaire ERV and air filtration systems ensure an optimal environment for the artifacts and visitors, too.

"We wanted to build a timeless structure that would last 100 years, and provide the owner with the lowest lifecycle costs possible," said Mark Thiessen, Principal of Angelo Architectural Associates, in Des Moines.

And that they did. It seems there's no shortage of John Wayne fans, because nearly everyone on the job sought out involvement based on a mutual interest. In addition to Thiessen, Downes worked with Dan Bush, of Newcastle Enterprises, Anthony Sherman, of HVAC firm Sherman Co., and Dick Burhans, of manufacturer's rep firm, ReBearth Products, Inc., for expertise during design and integration of the geothermal and ERV systems.

(L-R) Mark Thiessen, Architect, Angelo Architectural Associates, Dan Bush, New Castle Enterprises, Brian Downes, John Wayne Birthplace Executive Director, Anthony Sherman, Sherman Co., Dick Burhans, ReBearth Products, Inc. Photo provided by Common Ground





Anthony Sherman, owner of HVAC firm Sherman Co. checks a five-and-a-half-ton Modine Geothermal unit; one of two similar units at the museum. Photo provided by Common Ground

As the project broke ground in April of 2014, two separate, vertical geothermal exchange fields were drilled. Designed by ReBearth Products and drilled by Iowa Geothermal Services, each field consists of four holes bored to a depth of 300 feet, then filled with GeoPro enhanced bentonite grout mix for maximum performance.

"Bentonite alone will give you a thermal conductivity factor of .4," said Burhans, whose company started out nearly 30 years ago as an environmental consulting firm. As it grew, they started supplying equipment and material for the environmental, geothermal, and





Each of the two geothermal systems at the Birthplace Museum uses four, 300-foot-deep boreholes. Photo by Dick Burhans

horizontal-vertical drilling markets before moving into HVAC.

"By adding four bags of silica sand for each bag of bentonite, the conductivity factor more than doubles," he continued. The company's background and experience makes them an invaluable asset for contractors looking to tackle geothermal projects large and small.

### Tough parameters

Inside the building, the pair of 5<sup>1</sup>/<sub>2</sub> -ton water-to-air heat pumps draw from the exchange fields. A downdraft unit serves the upstairs and gallery area only, where all the valuable John Wayne artifacts are on display or stored. The other unit, an updraft configuration, conditions the first floor's entry, gift shop, theater and office. "About 95% of our projects include geothermal and ICF," said Bush, whose construction firm focuses on green, high-end commercial and residential projects. "Here, the main challenge was designing for the "people" load in such a tight building envelope. Maximum occupancy is about 150 people, and we

lowa Geothermal services installs the bore field for the system that serves the museum proper. Photo by Dick Burhans



Volume 13, Number 1



Anthony Sherman and Dick Burhans check the downstairs Modine Geothermal unit before the grand opening event. Photo by Common Ground

need to maintain stringent set points. It's a lot different than building a tight home."

The 4,000 square-foot gallery contains one-of-a-kind items that are sensitive to humidity and temperature fluctuation. A \$75,000 Andy Warhol painting of The Duke, scene props, letters, signs, costumes and no shortage of leather wearables fill the space.

After some research and thorough discussion with larger museums around the country, Downes determined that the ideal environment for the artifacts is between 66 and 68°F, with humidity levels around 60%. The latter is



accomplished via steam humidifiers that serve each of the main supply ducts.

To further protect artifacts and building occupants, MERV 13 filtration is installed on both of the geothermal systems. Two, 200 CFM ERV units serve the building as well; one on each trunk line. Boreholes are drilled with 150 feet of where John Wayne was born.

Photo by Dick Burhans



### Multi-level zoning

"These heat pumps have a strong air flow, which was a big plus downstairs where they're pushing air quite a distance," said Burhans. "At the same time, they're surprisingly quiet, which was important in the theater and the museum."

The museum proper and upstairs is served by a single zone, but with a twist. On the west side of the building is a large display window that showcases Duke artifacts. The window area is isolated from the museum by concrete walls, ceiling and a heavy steel door, in the event someone manages to gain entry through the window.

Given the room's mere 30-squarefoot space and the massive window, the solar gain would raise the temperatures to levels that could – over time – damage display items. To avoid this, Sherman technicians installed a three-inch vent and in-line fan off the main supply duct. The fan operates off a thermostat.

The main unit downstairs serves two true zones. One is comprised of the lobby and gift-shop with the entry way



Dan Vastyan is an account manager and writer for Common Ground, a trade communications firm based in Manheim, PA. He graduated from PSU with a Bachelor of Science Degree in 2009 and, since then, has researched and written about state-of-the-art mechanical systems. He can be reached at cground2@ptd.net, or by calling 717/587-9595. and office included. The second zone is the theater, which is full of seats from the world-famous Grauman's Chinese Theater in LA. The theater zone has three levels of ductwork. As more people come into the space, supply increases as needed.

"I was a bit concerned about the units' ability to comfortably handle the heating load in the entry area based on all the large windows," said Thiessen. "But we've now gone through one full heating season without an issue of any kind. I think that says a lot for both the technology and solid design on the front end."

While system efficiency was a main design consideration, the goal for the heating, cooling and ventilation systems within the building was to provide a comfortable environment for visitors and a safe atmosphere for priceless antiques.

The John Wayne Birthplace is the only museum dedicated to John Wayne, and contains over \$2 million worth of artifacts. So far, the HVAC design has proven more than capable in terms of occupant comfort, sustainable operation and protection of artifacts.

If he were here to see it for himself, the Duke would likely regale the construction team with appreciation, saying: "Waaal, that's a mighty fine job you've done there, fellas."





Photo by The John Wayne Birthplace Museum

Volume 13, Number 1

