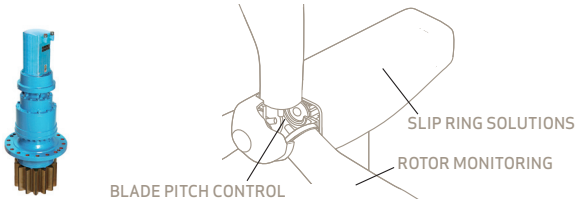
Reprinted with permission from ***North American Clean Energy,*** November/December 2008 issue.

MOOG

When the Wind Blows

Pitch Control Systems Turn

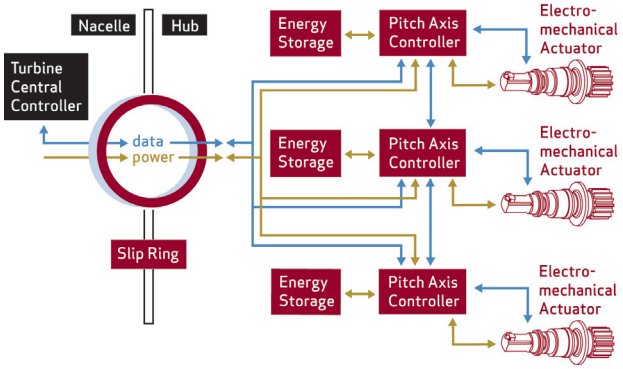
By Dr Sherif El-Henaoui



Visit YouTube and type in the phrase "wind turbine explodes," and you will see what could be fodder for an ad about the benefits of pitch control systems. Beyond those who design and make these systems, the technology does not attract a lot of attention. But it should. A pitch control system holds the key to maximizing and protecting a multimillion-dollar wind turbine.

Pitch control systems are found in the hub of a wind turbine's prop. These unsung systems make it possible for a wind turbine operator to control the inclination angle of a turbine's blades. According to the European Wind Energy Association, pitch control systems cost approximately three percent of a wind turbine's price. But, like an insurance policy, a small investment makes a large difference when conditions turn from good to bad. As of 2007, analysts with Intercedent Asia estimated that 90% of new wind turbines included pitch control systems. Although these systems are virtually ubiquitous, knowledge about them is less so.

When the wind blows at 25 meters per second (50 mph) or higher, a wind turbine needs a failsafe to put its blades at an angle where the load is reduced and the wind turbine stops. Pitch control systems – which generally come in two forms, electric or hydraulic – do the turning. Pitch control is not limited to failsafe situations, though. To set the turbine's blades at the best angle for superior output, these systems will also pitch (or turn) the blades a few degrees when the wind builds to roughly 12 to 13 meters per second (27 to 29 mph), which is when the turbine reaches peak performance. Reliably adjusting the angle of the blades is where pitch control systems earn their keep.



The Danish Wind Industry Association recently wrote that "designing a pitch controlled wind turbine requires some clever engineering to make sure that the rotor blades pitch exactly the amount required." Most wind turbine manufacturers – Enercon and Vestas are a few exceptions – tap others to make pitch control systems, so the subtleties of the designs may go undetected. For a buyer of wind turbines, it is important to know that most manufacturers are wedded to the use of either hydraulic or electric pitch control systems. Rarely do makers of wind turbines use both types. And, according to research from Intercedent Asia: "The [end users] choice of pitch control system and design is wholly a function of their choice of manufacturer." Nobody would advise a buyer to choose a wind turbine primarily for the type of pitch control systems it includes.

But understanding the differences between these systems will help a buyer's overall purchasing decision.

Those familiar with pitch control systems will have varying points of view as to which system is superior and why. With electric pitch control systems, there is no risk of leaking hydraulic fluid. As a result, these systems pose no environmental issues, which can arise with a system relying on oil under high pressure. There is also lower consumption, or energy waste. Electric pitch control systems tend to consume less power than hydraulic ones because the latter require a pump running at all times. That pump draws energy to keep the system's oil at high pressure, as well as ready at a moment's notice when rotor blades must be turned. In electric pitch control systems, however, the failsafe batteries or capacitors are a weakness. The lifetime for a pitch control system's battery pack is two or, possibly, three years. When its life is over, it is an undertaking to replace it. Just imagine scaling a 2MW wind turbine to switch out a battery in the hub of the prop.

"Supporters of both the hydraulic and electric systems always claim advantages to each type of technology," said Peter Baldwin, a researcher with Intercedent Asia. "On the one hand, there's a strong appeal for electric because of environmental issues. Another advantage to electric is that it's better for colder climates because the oil in hydraulic systems lose viscosity as the temperature plummets. But the speed and reliability of hydraulic systems is a clear strength.

"Maintenance and diagnostics are said to be easier with hydraulic because less technical components are used," added Baldwin. "And, in spite of rising oil costs, the price of hydraulic fluid in pitch control systems isn't significant because it's a closed system, recycling virtually all of the oil it needs."

So which type of pitch control system is better? There is no clear winner, yet. Developments on the horizon suggest that manufacturers of wind turbines may see a third option: a hybrid solution for pitch control systems. With hybrid technology, the wind turbine's blades are turned electrically and the failsafe, which prevents damage to the blades, runs hydraulically. Proponents of developing hybrid solutions say the risk of leaking oil would be mitigated because the pitch control would rely mostly on electrical power. They contend energy costs would be lower, too. Since the hybrid pitch control systems would rely on a hydraulic system for failsafe power, advocates point out that buyers wouldn't have to worry about their failsafe battery losing its charge within a few years.

Along with helping to efficiently produce power from the wind, the pitch control systems – no matter what type a buyer owns – play a critical role in protecting and capitalizing on an investment in a wind turbine. Whether someone selects electric, hydraulic, or hybrid, buyers owe it to themselves to understand this often overlooked system and use that knowhow when purchasing a wind turbine.

Dr Sherif El-Henaoui is the European marketing manager for Moog, Inc. (NYSE: MOG.A and MOG.B). He also manages activities for core industries, such as plastics machinery, and developing markets, such as wind energy and services.

Moog Inc. | www.moog.com

Resources

Danish Wind Industry Association
www.windpower.org

European Wind Energy Association
www.ewea.org

Intercedent Asia
www.intercedeasia.com

Moog is a leader in high-performance solutions that maximize reliability in wind applications around the world. In addition to electric and hydraulic blade pitch control products and systems, Moog provides leading-edge slip ring solutions for power and data transmission, rotor monitoring technologies, and blade testing capabilities.

GLOBAL OFFICES

Argentina
+54 11 4326 5916
wind.argentina@moog.com

Australia
+61 3 9561 6044
wind.australia@moog.com

Austria
+43 664 144 65 80
wind.austria@moog.com

Brazil
+55 11 5523 8011
wind.brazil@moog.com

Canada
+1 716 652 2000
wind.canada@moog.com

China
+86 21 2893 1600
wind.china@moog.com

Finland
+358 10 422 1840
wind.finland@moog.com

France
+33 1 4560 7000
wind.france@moog.com

Germany
+49 2303 77910
wind.germany@moog.com

Hong Kong
+852 2 635 3200
wind.hongkong@moog.com

India
+91 80 4120 8785
wind.india@moog.com

Ireland
+353 21 451 9000
wind.ireland@moog.com

Italy
+39 0332 421111
wind.italy@moog.com

Japan
+81 463 55 3767
wind.japan@moog.com

Korea
+82 31 764 6711
wind.korea@moog.com

Luxembourg
+352 40 46 401
wind.luxembourg@moog.com

Netherlands
+31 252 462 000
wind.netherlands@moog.com

Norway
+47 64 94 19 48
wind.norway@moog.com

Russia
+7 831713 1811
wind.russia@moog.com

Singapore
+65 6773 6238
wind.singapore@moog.com

South Africa
+27 12 653 6768
wind.southafrica@moog.com

Spain
+34 902 133 240
wind.spain@moog.com

Sweden
+46 31 680 060
wind.sweden@moog.com

Switzerland
+41 71 394 5010
wind.switzerland@moog.com

United Kingdom
+44 1684 296600
wind.uk@moog.com

USA
+1 716 652 2000
wind.usa@moog.com

www.moog.com/wind

Mobium/PDF/0609