

## Water Hammer Created New York Explosion

On July 18, 2007, when a huge explosion rocked the heart of New York City, many people believed another terrorist attack had occurred. To America's surprise the source of the explosion was Consolidated Edison's steam distribution system.

At about 6 p.m. that day, a 24-inch diameter steam pipe installed in 1924 ruptured into a thunderous explosion that ripped apart Lexington Avenue and 41st streets. The explosion sent a geyser of hot steam and debris more than 1,000 feet into the air and left a crater 35-feet wide and 15-feet deep. A 51-year-old New Jersey woman died of a heart attack while fleeing the disaster area and 45 other people were injured. Property damage to 15-20 buildings and business disruption costs were estimated to be about \$30 million.

Specifically, the explosion was caused by a phenomenon known as "water hammer," explained Mark Vogler, Superintendent of Thermal Engineering at Citizens Thermal Energy, at the recent fall steam customer meeting held at Lucas Oil Stadium.

"The basic definition of a water hammer is an impact load created by the sudden starting or stopping of a liquid in a piping system. However, it is a complex phenomenon with numerous causes, often involving multiple factors," Vogler said.

Important **misconceptions** about the causes of water hammer are:

- You must have high velocity steam to push a slug of water fast enough to cause damage.
- You can bleed condensate past a gate valve if you "go slow."
- Only higher pressure steam, such as 150 psig, can create a dangerous water hammer.

Vogler explained that water hammer can occur in lower pressured systems. "The ingredients needed are a closed piping system with the buildup of sub-cooled condensate and flowing steam. As condensate levels rise, steam velocity and turbulence increases, which in turn creates waves inside the pipe. Eventually,



*Water hammer can cause catastrophic pipe damage.*

steam becomes trapped and creates a steam bubble inside the pipe. When the bubble collapses - bang," Vogler commented.

Potential causes of condensate buildup that can lead to water hammer include:

- Live steam sloped against a closed valve
- Clogged steam traps
- Low spots in the piping system
- Improper system startup

Steps to avoid condensate induced water hammer include:

- Keeping systems drained
- Proper system maintenance
- Proper insulation on pipe
- Ensuring pipe insulation stays dry
- Proper start-up procedures

Vogler said startup procedures should always include draining the system before introducing steam, never mixing steam and sub-cooled condensate, proper venting, and slowly energizing the entire system.

It was also clear that the New York incident was impacted by a number of internal and external factors, according to Vogler. "They had a partially-clogged steam trap, near-zero steam flow, and broken storm sewer which allowed the steam line to become submerged with water due to heavy rain. Several hours later, a change in system load allowed steam to mix with sub-cooled condensate and the result was very destructive," Vogler said.

Vogler concluded that Citizens Thermal works very hard to avoid the factors that can lead to water hammer. Citizens customers with additional questions about water hammer are encouraged to contact Bill Petty, Manager of Market Development, at 927-4742.



*Water hammer caused devastation in New York.*

## Citizens Thermal Adds 6,500 Tons of Cooling Load in 2008



The Illinois Street Chilled Water Plant, above and below, is meeting the growing cooling needs of downtown Indianapolis.



Citizens Thermal has 6,500 tons of new cooling load on its system thanks to expansions at its West Street and Illinois Street Chilled Water Plants.

The company added two, 2,000-ton chillers at West Street and a new 2,500-ton chiller at the new Illinois Street Plant. Another 2,500 ton chiller is planned for Illinois Street by June 2009. The new cooling load is accommodating ongoing cooling demand growth throughout the downtown area.

The Illinois Street Plant also was recognized recently with an Achievement Award for Engineering at the Monumental Affair Design Awards Event sponsored by Keep Indianapolis Beautiful. The awards honor and encourage those who have contributed to the quality of life through the enhancement and beautification of Marion County's visual and physical environment.

## Citizens Thermal Installing Topping Turbines to Improve Efficiency at Perry K

Citizens Thermal is in the process of installing two 1.7 megawatt topping turbines at its Perry K Steam Plant.

Currently, some of the high-pressure steam produced at Perry K is diverted through pressure reducing valves and then cooled to meet customer requirements. By flowing that steam through these back-pressure turbines instead, the pressure and temperature can still be reduced and we can generate electricity in the process," explained Mark Vogler, Superintendent of Thermal Engineering for Citizens Thermal.

The electricity generated from the new turbine generators will help Thermal significantly reduce purchased power as well as reduce demand and power factor charges. These cost reductions will initially fund the cost of the new units and eventually help Thermal reduce its overall operating costs.

Construction for the turbine installation began recently and will continue throughout the winter. The new turbines are expected to be online sometime in the spring of 2009.



A new topping turbine awaits installation at Perry K.

## Energy Prices and Weather on a Wild Ride

A rollercoaster is the best word to describe the variability of energy prices and the weather in 2008.

During the first half of 2008, oil prices rocketed to more than \$130 per barrel, an all-time record when adjusted for inflation. Besides increasing demand from developing countries like China and India, much of the increase in oil prices was attributed to investors purchasing oil as a hedge against the falling value of the U.S. dollar.

In addition to buying oil, investors also bought natural gas and coal, pushing the price of these commodities up significantly during the first half of 2008. After very stable prices throughout 2007, natural gas prices rose steadily from about \$7 per million cubic feet (mcf) in January to more than \$13 per mcf in July. Likewise, prices for Illinois basin coal rose from about \$35 per ton in January to \$95 a ton in October.

Since July, the rollercoaster has begun to rocket downward. Following the collapse of the U.S. financial system and an emerging global economic recession, energy prices began to collapse, led by oil.

The U.S. Energy Information Administration's energy price predictions for the next year are mixed at best.

**Oil** - While EIA expects oil prices to remain low for the next few months, prices for 2009 could rebound because tight credit markets may further shut down production projects.

**Natural gas** - The economic downturn is expected to lower natural gas prices over the next few months and throughout

2009. On Oct. 1, EIA predicted an average price of \$8.17 per mcf for 2009, but its revised projection calls for an average price of \$6.82 per mcf.

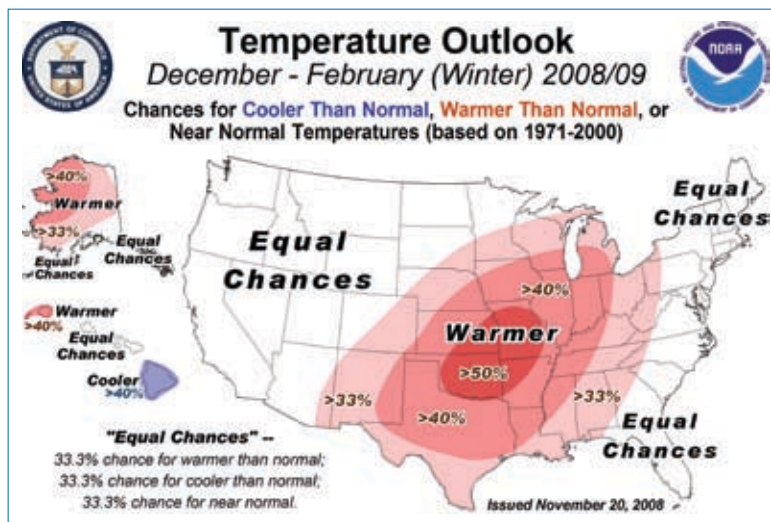
**Coal** - Prices should fall gradually in 2008 due to flat electricity demand across the U.S. Electric prices across the nation are expected to increase about 6.5 percent in 2009 due to higher coal prices. Citizens Thermal is well positioned on coal prices given that its current coal contract calls for only 3 percent increases per year through 2010.

While energy prices have been on a rollercoaster, weather has been just as variable. After record warmth in October and early November, much colder than normal weather descended on the Midwest in mid to late-November. The National Oceanic and Atmospheric Administration (NOAA) has again issued a somewhat guarded forecast for winter 2008-2009.

NOAA is calling for warmer than normal temperatures for the center of the U.S., including Indiana. However, the absence of the La Nina and El Nino forces in the Pacific

Ocean make seasonal forecasts "increasingly challenging," says NOAA. Instead, NOAA believes less predictable forces over the Arctic and North Atlantic will impact weather over the U.S.

"These patterns are only predictable a week or two in advance and could persist for weeks at a time," said Michael Halpert, deputy director, of NOAA's Climate Prediction Center. "Therefore, we expect variability or substantial changes in temperature across much of the country."



## Precautions for Season Start-up

With the heating season now upon us, many of our customers are re-energizing their steam heating systems. There are precautions that we would recommend during this start-up process.

As you open your steam valve, it is possible to encounter a phenomenon known as water hammer. As steam enters a cold piping system, it condenses to water (condensate), and if not properly drained, a condition for condensate induced water hammer can quickly develop. In severe cases, this condition can cause valves and pipes to rupture, causing damage and perhaps personal injury.

Steam traps are located throughout buildings to remove condensate and air from steam systems during normal operations. If the traps are not working properly, water hammer may occur. We encourage everyone to have their traps checked for proper operation on at least an annual basis by your maintenance staff or a qualified contractor. The fall start-up is a perfect time to inspect the building's traps and steam system components.

Before energizing your steam system, first ensure that all water is drained from it. Then open the steam valve slightly to begin a very

gradual warm-up. Continue to open the valve slowly until the valve is fully open. This process can take several hours (depending on the size of your building) to get the system up to normal temperature and the valve fully open. If you encounter excessive amounts of condensate or hammering noises during this process, do not continue to energize the system. Immediately isolate the steam source and remove any accumulated condensate. Once the condensate has been removed, the system can then be re-energized.

The fall heating system start-up is an excellent time to make a visual inspection of your steam system. Look for areas of insulation that may need repair or leaks that need to be addressed. Keeping your heating system well insulated and in good operating condition can result in significant savings in your building heating costs.

If you have questions or concerns related to a Fall start-up of your steam system, please feel free to call our Citizens Thermal Energy Customer Service Department at 317-261-8794. If requested and at no charge, Citizens Thermal Energy will provide assistance to customers with this seasonal start-up process.

## Covanta Contract Means Reliable Supply and 5 percent Rate Adjustment

Effective December 1, 2008, Citizens Thermal puts in place a 20-year agreement for reliable, cost-effective steam from Covanta Indianapolis, Inc. The new Covanta contract results in an overall rate increase of about 5 percent for all Citizens Thermal customers, also effective December 1.

This 5 percent increase is the second part of the two-phase steam rate increase approved by the Indiana Utility Regulatory Commission (IURC) in its October 30, 2007 Order in Cause No. 43201. The percent increase to Rate 2 customers is slightly higher and will average approximately 7.64 percent. The Rate 2 Demand Charge will increase from \$127.00 to \$137.00 per therm per hour and the Rate 2 Energy Charge will increase from \$0.2069 to \$0.2507 per therm.

Pursuant to the long term contract, also approved by the IURC, Covanta will continue to provide approximately 40 percent of Citizens Thermal's projected steam load from a renewable energy source, which in addition

to being low cost, has the added benefit of significantly reducing the community's solid waste disposal requirements. Even with the increase resulting from the new Covanta contract, purchasing steam from Covanta will continue to be one of the most cost-effective ways of supplying steam to our customers.

Citizens Thermal remains strongly committed to doing all it can to hold down operating costs and make wise fuel purchasing decisions. Even after the rate adjustment, steam service from Citizens Thermal remains highly competitive with other forms of energy available in Indianapolis. In addition, taking advantage of Citizens Thermal's district energy system allows you to focus on your core business and avoid costly capital investments in energy equipment and staffing.

As always, if you have questions about the steam rate increase or any other issue related to your service, feel free to contact Bill Petty at (317) 927-4742. He would be happy to meet with you to discuss your specific situation.

## Tree Planting at Doris Cowherd Park

Citizens Energy Group employees recently participated in a tree-planting event at Doris Cowherd Park in Indianapolis. Citizens Thermal has partnered with Keep Indianapolis Beautiful and Indianapolis Downtown Inc., in recent years on a number of landscaping and beautification projects.



## Employee Spotlight - Joe Ray

### What is your job title?

Joe was recently promoted to Senior Operator at the West Street Chilled Water facility. This also includes responsibilities at the chilled water satellite plants (Illinois St, IUPUI, ICE, ICC).

### What is your favorite part of the job?

Analyzing methods to improve plant efficiency.

### What did you do before coming to Thermal?

I worked as a HVAC Crew Leader at Dow Chemical for 14 years.

### What are your hobbies outside of work?

When I'm not at work, I enjoy spending time with my family and watching Colts football.



### Steam and Chilled Water Service Telephone Numbers

**Dave Toombs**,  
Thermal General Manager,  
317-693-8805 (office)  
317-727-1342 (cell)

**John Eddington**,  
Director, Facility Operations  
317-236-6710 (office)  
317-695-0688 (cell)

**Bob Purdue**, Plant Manager  
(Steam Operations)  
317-693-8801 (office)  
317-695-0512 (cell)

**Bob Asher**,  
Manager Customer Services  
& Distribution  
317-693-8704 (office)  
317-517-0688 (cell)

**Sharon Connell**,  
Customer Service & Billing  
Representative  
317-261-8794

**Bob Taber, Foreman**,  
Customer Service & Metering  
317-693-8883 (office)  
317-695-7924 (cell)

**Toll Free Number - Customer  
Service & Billing**  
877-313-2467

**Kenny Cox**,  
Manager Operations & Maintenance  
317-693-8884 (office)  
812-929-1415 (cell)

**Todd Fuller**, Facilities Manager  
(Chilled Water Operations)  
317-236-6702 (office)  
317-695-2099 (cell)

**Joe Ray**,  
Operations Supervisor  
Chilled Water Operations  
317-236-6704 (office)  
317-695-0276 (cell)

### Other telephone numbers: Marketing - Steam and Chilled Water

**Bill Petty**,  
Manager Market Development  
317-927-4742 (office)  
317-431-3358 (cell)

**Steam and Chilled Water Service  
Emergency Contacts**  
*In the event of a steam or chilled  
water emergency, Citizens Thermal  
Energy can be reached at the  
following numbers:*

**Steam Plant Operations  
Emergency 24-Hour Number  
(Steam Operations Control Room)**  
317-261-8804

**Shift Supervisor's Office**  
317-261-8819

**Ron Pinkins**,  
Operations Supervisor  
317-693-8807 (office)  
317-431-4414 (cell)

**Lindsay Lindgren**,  
Vice President, Gas & Steam Operations  
317-927-6001 (office)  
317-696-6377 (cell)

**Chilled Water Plant Operations  
Emergency 24-Hour Number  
(Chilled Water Control Room)**  
317-236-6700