

# **Big Eau Pleine Reservoir Aeration System**

## **THE ORIGINAL PROBLEM OF FISHKILLS**

Since being built in 1937 the Big Eau Pleine reservoir has suffered through more than 20 late-winter fishkills of varying severity. These fishkills are the result of extremely low oxygen conditions in the water. Winter ice formation stops the transfer of oxygen into the water from the air. Oxygen in the water is then used up by the decomposition of excessive organic material. This organic material can be from farm manure runoff, municipalities and factories, bad septic systems, and decaying algae blooms from excess farm and residential fertilizer runoff. Factors that accelerate oxygen-robbing decomposition are: the darkness of wintertime snow on top of the ice causing plants to die, low water levels, organic loading into the reservoir from the previous summer, and organic load from wintertime runoff events caused by snowmelts or rain. Things that add oxygen to the reservoir are the amount of fresh/highly oxygenated water brought into the reservoir from the BEP river, and the size of open water areas that add oxygen naturally from the air into the water.

## **GETTING THE ORIGINAL AERATOR**

In 1981 the Marathon County Parks Department, the Department of Natural Resources, Wisconsin Valley Improvement Company (WVIC), Marshfield and Mosinee sportsmens, and the Big Eau Pleine Property Owners Association joined in a cooperative effort to raise funds, purchase, install and operate an aeration system in the reservoir near the Big Eau Pleine County Park. The original aeration system cost about \$50,000 and was designed to help minimize the occurrence and severity of winter fishkills.

## **HOW THE AERATOR WORKS**

Two blowers supplied air to 22,000 feet of PVC lines installed at the bottom of the reservoir. The rising air circulates warmer layers of water from the bottom of the lake to the surface. This action created 30-60 acres of open water for natural surface aeration providing a limited refuge for fish. A lesser amount of oxygen is also transferred to the water directly from the air bubbles rising through the water.

## **AERATOR OPERATION**

Each winter dissolved oxygen conditions are monitored by WVIC. Aerator operations are begun when conditions dictate the need. The length of time the aerator operates varies from year to year and has ranged from 0 days (when not needed) to 74 days with an average over the last 10 years of 35 days. The electrical operating costs for the aeration system currently average approximately \$136/day and have been paid by WVIC since aerator operation began.

The aeration system was quite successful for many years at preventing major fish kills. Over the years, some of this equipment has degraded. It is known that some of the lines have broken and there is significant enlargement of the holes in the lines.

## **FISHKILL**

This past winter a combination of events resulted in a massive 60-80% fishkill. The summer and fall were dry and the reservoir level was low going into the winter. Heavy snowfall in December blocked sunlight promoting decomposition of organic material within the reservoir. Extra organic material was brought into the reservoir by a mid-February snowmelt. And the aerator, previously key to providing a limited fish refuge, was operating very ineffectively due to its significant deterioration. By the time the ice began melting it was very obvious to all that a massive fishkill had resulted.

BEPCO (Big Eau Pleine Citizens Organization) reformed in late 2008 due to concerns about low water levels. The winter fishkill became a rallying point for all. BEPCO sponsored a symposium, inviting all parties who could help, vowing to "NEVER LET THIS HAPPEN AGAIN".

## **NEW PLANS FOR A NEW AERATOR**

The planned upgrades will increase the aeration system's operating capacities beyond its original design. This will be achieved by increasing the blower speeds and therefore increasing the volume of air pumped into the reservoir by up to 40% over the original design. The original 1½ inch PVC lines will be replaced with larger 2 inch lines.

There are other minor equipment replacement needs that are being replaced for safety and environmental reasons. The PVC aeration field size will remain largely the same at about one square mile and in the same location as the existing aerator field. The existing building housing the blowers will remain. The total expected cost of the aerator project is \$54,179.94.

The new aerator should further mitigate low dissolved oxygen conditions and provide a better although still limited, refuge for fish. This is not a guarantee that there will not be another fishkill, but history is on our side favoring a properly operating aerator.

#### PAYING FOR THE AERATOR

BEPCO is working with local townships to apply to Marathon County for a grant from the American Transmission Company (ATC) Mitigation Fund. The ATC Fund provides a 50/50 cost-share arrangement so \$27,089.97 needs to be matched through a BEPCO sponsored fund raising effort. BEPCO is committed to getting these funds raised. WVIC and DNR will contribute to BEPCO the funds for the aerator building upgrades or \$4,050.

To date, WVIC has expended approximately \$4,250 in labor working with BEPCO and DNR in evaluating the aeration system and developing cost estimates for upgrades. WVIC plans to contribute several times this amount through in labor and equipment use for removal of the old 1½ inch PVC lines, and installation of the new 2 inch PVC lines. These in-kind contributions from WVIC is not included in the \$54,179.94 estimate.

#### TIMELINE

The BEPCO aerator fundraiser is beginning now and is expected to be completed by September 30. The work schedule is for WVIC's crews and professional divers to begin removing the old lines by early to mid-September. Installing new PVC lines will be conducted in the winter as soon as the ice is thick enough to support vehicles (12 inches). A root cutting machine will be used to cut slots in the ice on survey coordinates for each PVC line, metal rebar will be attached to the PVC lines and they will be sunk in the reservoir.

#### OPERATION OF NEW AERATOR

DNR staff will purchase and erect a safety fence and warning signs, and operate the aeration system during the winter 2010. WVIC agreed to pay the cost of the electricity for operating the aeration system this winter. WVIC will also be monitoring D.O. and Biological Oxygen Demand (BOD) conditions in the reservoir throughout the winter and coordinating aerator operation with the DNR.

#### FUTURE PLANS

Marathon County, DNR, WVIC, and BEPCO have formed a team that meets bi-weekly called the Big Eau Pleine workgroup to address longer-term issues on the Big Eau Pleine. These include: long term aerator operations and resolving water quality/pollution issues in the watershed. BEPCO will continue to be an advocate for the citizens who use and appreciate the Big Eau Pleine flowage.