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VHS Regulations Impact Arkansas Aquaculture

Andy Goodwin
Extension Fish Pathologist

A previously unknown strain of VHS virus has entered the Great Lakes and caused impressive fish kills. The first losses were freshwater drum and exotic round gobies during 2005, but in 2006 popular species like muskellunge, smallmouth bass, and yellow perch were affected causing great alarm among fishermen, natural fisheries managers, state and federal agencies, and the aquaculture industry. There was near universal agreement that it was important to prevent movement of the virus out of the Great Lakes or into commercial aquaculture. Control efforts began, and since then it has been a continuing demonstration of just how difficult things can become when well intentioned regulations written by knowledgeable people meet up with the complexities of the real world.

The first formal regulatory move was made by the USDA. The USDA-APHIS folks called a meeting in Washington for October 31, 2006 to meet with aquaculture industry representatives and state authorities to discuss what action was needed to prevent the spread of VHSV. Unfortunately, in the week prior to that meeting, concern about the discovery of VHS in some important commercial species caused APHIS to issue a sweeping Emergency Order that stopped all interstate movement of 37 "VHS-susceptible" fish species out of any of the 8 Great Lakes States. This caused the participants in the October 31 meeting to change from "friendly cooperators in VHS control" to "angry opponents." The most serious issues raised about the Emergency Order at that meeting were that 1) the rule affected farms that were hundreds of miles from the VHS outbreak and often on different watersheds, 2) it made no exceptions of any kind, including for farms raising fish in well water and with strong virus inspection histories, 3) fish could not even cross state lines between the 8 Great Lakes States, and 4) the list of susceptible species included many for which the evidence was preliminary and did not include others that were harvested and shipped live from the lakes, but that had not yet been tested for VHS. In early November, APHIS issued an amended order that addressed some of the participants' concerns.

The amended order allowed some movement of fish out of the Great Lakes States for processing, research and diagnostic purposes, and for other commerce as long a certain conditions were met. Farmers wishing to ship live fish out of their states were allowed to do so as along as their "State Competent Authority" (that is, the agriculture or wildlife agency with regulatory oversight of the aquaculture disease) would sign off on paperwork stating that the fish had been found free of VHS according to methods outlined in the Inspection Section of the AFS-Blue Book or OIE Manual (chapter 2.1.5).

The Amended Emergency Order requires that the authorities of the shipping state (*not the recipient state*) verify that exported fish meet the Blue Book or OIE Standard, but differences in interpretation and enforcement are likely to result in shipments of some fish where the concerns of the recipient state are not adequately addressed. In response, many

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states are amending their regulations to include strict import requirements. The first State to do so was New York, just before Thanksgiving. The New York regulations now require that all fish destined for the waters of New York be inspected for a lengthy list of bacteria, viruses, and parasites. In order to meet this requirement, farms must inspect 60 fish of each species once per year. Given the "public waters" angle, this regulation has the greatest impact on bait and sportfish producers.

If you are a fish farmer outside the eight Great Lake states, you can still ship fish into the Great Lakes states without any problem. The APHIS order applies only to fish leaving those states. Keep in mind though that once your fish are off your truck in a Great Lakes State, or if you take on water or fish in one of those states, then the whole load is subject to the Amended Emergency Order and cannot leave the state unless that state's "competent authority" provides the needed VHS documentation. If you are shipping fish into New York the new state regulations require you to have 60 fish per species (150 maximum) tested for viruses, bacteria, and parasites before you ship. For farms that already have a farm level VHS testing history, the additional bacteria and parasites tests take only 4 days. If you need to have the virus testing done too, that takes three weeks. The new APHIS regulations do not apply (*yet*) to golden shiners, goldfish, and fathead minnows, but these species are affected by the New York regulations. Before shipping fish to any state, be sure that the state regulations have not recently changed.

The next step in the regulation of VHS by APHIS will be the development of an "Interim Rule." It is not yet clear what this will look like, but it is certainly possible that VHS testing requirements will be extended to more states. If this happens, farms that have a farm-level VHS testing history or that are participating in the Arkansas Bait and Ornamental Fish Certification Program will automatically meet the new regulations. Other farms may experience shipping delays as required testing is conducted.

Arkansas farmers that ship live fish need to keep aware of these changing regulations. The APHIS and NAA web sites are helpful, but farmers wishing to keep abreast of the latest changes and what they mean should send their e-mail address to me at agoodwin@uaex.edu. Baitfish, sportfish, and foodfish farmers doing business in New York must make sure that they meet those New York regulations. I urge all our bait and ornamental fish farms to participate in the new Arkansas certification program to avoid future impacts of disease regulations. Catfish fingerling producers that ship to other states may wish to start farm-level inspections, but it is likely that catfish will *not* be included in future APHIS regulations. If you are doing business in the Great Lakes region, be sure that you understand all the implications of the new regulations. If you have any doubt, call me at UAPB. We have already helped dozens of farms and inspected thousands of fish. Above all, do not bring Great Lakes fish, especially bait or other fish that have close ties to wild stocks, into Arkansas!

APHIS Site:
www.aphis.usda.gov/vs/aqua/

NAA VHS Site: www.nationalaquaculture.org/pages/vhs.html

Cultured Arkansas fish currently listed in the APHIS Amended Emergency Order (of 37 listed species): black crappie, bluegill, brown trout, channel catfish, gizzard shad, largemouth bass, muskellunge, rainbow trout, smallmouth bass, walleye, white bass, yellow perch

New Employee at Lonoke

Sathyanand Kumaran
Extension Associate

It is my pleasure to introduce myself as the new Extension associate in fish health at the Lonoke Agricultural Extension and Research Center. My primary duties are to assist Dr. Jo Sadler with health diagnostics and to assist in research. I have a master's degree in aquaculture from UAPB and a master's degree in seafood technology from the Central Institute of Fisheries Technology, India.

I am from Kerala, India. My hobbies include portrait drawing, acting and dancing. I love reading inspiring books and books pertaining to people skills and management. My favorite game is cricket, but I do enjoy playing baseball.

I have been in Arkansas for nearly three years and I like being here. The weather is great! My research work as a student at UAPB focused on brood stock nutrition of fathead minnows. During that time I had the opportunity to visit production ponds and vats in the Lonoke area, and I am excited to be back again. It gives me immense pleasure to work at the minnow capital of the world!

Liming Rates for Fish Ponds

Hugh Thomforde
Extension Aquaculture Specialist

Aquaculture ponds which are filled from subsurface waters often contain abundant bicarbonate and therefore do not benefit from liming. But rainwater, and many stream waters, and even some well sources contain very little bicarbonate, and therefore require lime to improve the response to fertilization. Improved fertilization leads to increased fish production.

To find out if your pond needs liming collect a cup of pond water in a clean container. Avoid stirred-up bottom sediment. Have it tested for total alkalinity. It is sometimes helpful to submit also a dry composite sample of bottom sediment (collected as you would for cropland) and have it tested to determine the soil pH. Take the samples to your local County Extension office and request the testing, to determine if your pond would benefit from liming.

Pond water with less than 40 to 50 mg/L total alkalinity (milligrams per liter, measured as calcium carbonate), and any pond with soil below pH 7 will normally benefit from liming. Use the following table as a guide (from Boyd and others, 2002, page 19).

The lime requirement is estimated from either total alkalinity or soil pH. If both are known, use the highest dose rate from the table. For example, if total alkalinity is 15 mg/L but soil pH is 5.1, apply 2200 lb/ac.

Fertilization shortly after liming is counter-productive. Liming often results in clear water conditions, and temporarily removes phosphorus, an essential plant nutrient. The combination of clear conditions and lack of phosphorus encourages the growth of undesirable rooted aquatic plants. Avoid fertilization for at least several weeks after liming. It is best to lime ponds in the fall or winter. Use only finely ground *agricultural* lime in fish ponds. This is the same material commonly applied to cropland.

For further advice on this topic feel free to contact the author. The following references are recommended:

Boyd, Claude E., C.W. Wood, and Taworn Thunjai. 2002. Aquaculture pond bottom soil quality management. Aquaculture Collaborative Research Support Program, Oregon State University, Corvallis, Oregon 97331-1641. 41 pages

Goodwin, A., J. Jackson, N. Stone, T. Burnley, J. Farwick, and M. Armstrong. 2004. Farm pond management for recreational fishing. Cooperative Extension Program, University of Arkansas at Pine Bluff. Miscellaneous publication #360

Knud-Hansen, Christopher F. 1998. Pond fertilization: ecological approach and practical application. Aquaculture Collaborative Research Support Program, Oregon State University, Corvallis, Oregon 97331-1641. 125 pages

Wurts, William A., and Robert M. Durborow. 1992. Interactions of pH, carbon dioxide, alkalinity and hardness in fish ponds. Southern Regional Aquaculture Center, publication #464

Wurts, William A., and Michael P. Masser. 2004. Liming ponds for aquaculture. Southern Regional Aquaculture Center, publication #4100

Liming rates table

total alkalinity (mg/L)	soil pH	agricultural lime needed (lb/ac)
below 5	below 5.0	2700
5-10	5.0-5.4	2200
10-20	5.5-5.9	1800
20-30	6.0-6.4	1300
30-50	6.5-7.0	900

Research Round-up

Nathan Stone
Extension Fisheries Specialist

Welcome to the first "AFC Research Roundup" column. With each issue I'll attempt to summarize some of the research results from among the many projects underway at the Aquaculture/ Fisheries Center. For more information on each topic, please contact the researcher(s) directly.

Developing Diets for Fathead Minnow Broodfish - Those of you who utilize the UAPB Lonoke Fish Diagnostic Laboratory may have already met Sathyanand Kumaran. Sathya's Master's thesis research, under the direction of Dr. Rebecca Lochmann, looked at developing diets for fathead minnow brooders. It's known that feeding a good diet to brood fish improves the quality of resulting eggs and fry. High quality offspring are likelier to grow faster and have better survival. So what's a good yet economical diet for fathead minnow brooders? This was the question that Dr. Lochmann and Sathya sought to answer. It's known that fathead minnows are virtual egg laying machines, producing a quantity of eggs over the spawning season equaling 4 to 7 times the size of the female. Sort of like giving birth to a basketball team. This places tremendous nutritional demands on the female fathead minnow and could result in poor egg quality, especially later in the spawning season. The researchers utilized 24 outdoor pools for a study in which fathead minnows were fed four different 36% protein, 14-17% fat diets, with the diets containing either poultry fat or menhaden fish oil, and with proteins from animal (poultry & fish meal) or vegetable sources. The minnows also had access to natural foods during the study. Eggs were collected at intervals over the spawning season for analysis, hatching and fry quality evaluation.

Bottom line: They found that poultry fat and plant proteins were suitable ingredients for fathead minnow broodstock diets, equal in performance to the more expensive alternatives. So it's likely that commercially-available baitfish or catfish feeds are appropriate diets for fathead minnow brooders. For more information, contact Dr. Rebecca Lochmann at 870-575-8124 or rlochmann@uaex.edu.

Sathya at work removing fathead minnow eggs from spawning substrates.

Restricted Feeding of Catfish in Multiple-Batch Production Understocked with Large Stockers - What happens if in times of high feed costs and low fish prices, you don't feed catfish in multiple-batch production to satiation every day? What if you just feed every other day, or every third day? Previous studies clearly showed that when catfish were fed only every other day, the larger fish still reached market size, but the next crop was delayed a season due to poor growth of understocked fingerlings. What if large stockers were understocked instead of fingerlings - would that make a difference? This was the question posed to Dr. Carole Engle and research associate Adam Nanninga. They conducted a 12-pond study, stocking all the ponds in March with 2000 lb/acre of

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Feeding studies at UAPB are conducted using a mini-version of commercial feeders.

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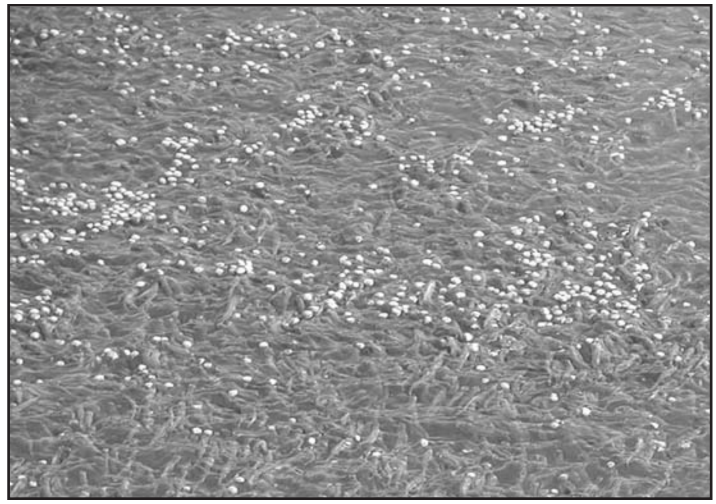
carry-over fish (0.88 lb average) and then adding 4,500 stockers per acre (0.15 lb/fish average). Fish were raised using typical commercial practices, including satiation feeding. Fish were fed daily (4 ponds), every other day (4 ponds) or every third day (4 ponds). Ponds were clean-harvested in October.

Bottom line: Even with stockers, feeding every day was important for maximizing growth. For both the carry-over fish and stockers, fish in ponds fed every day were significantly heavier. Stockers in ponds fed every other day were bigger than stockers in ponds fed every third day. For more information, contact Dr. Carole Engle at 870-575-8523 or cengle@uaex.edu.

Stocking Rates for Golden Shiner Fry to Raise Juveniles for Transfer - With the switch to hatcheries, golden shiner producers can now control the number of fry in ponds. The question is how many fry to stock to produce the greatest number of robust juveniles (peewees) for transfer to grow-out ponds. Research specialist Alex Kachowski and Dr. Nathan Stone, with assistance from Gerald Ludwig (USDA-ARS), conducted a 12-pond study to test four stocking densities for fry: 0.5, 1.0, 1.5 and 2.0 million fry /acre. Fry were stocked in May and cultured for 9 weeks (to mid-July). Fry were fed twice daily with minnow meal. After a month, they were switched to crumbles and then later to floating pellets, fed once daily to satiation. At harvest, yields averaged 757 lb/acre with no differences among the densities. Fish at the lowest density were bigger, but there were no differences in fish condition due to density, meaning that the small fish were equally plump and robust. Survival was reduced to an average of 40% in the 2 million/acre treatment, as compared to 71% survival for the 1.5 million/acre.



Small golden shiners feed aggressively on floating pellets.

Bottom line: Stocking 1.5 million fry /acre resulted in 1.0 million juveniles /acre. Higher stocking rates have been tried on farms, but reports are that the juveniles need to be harvested early, after only a month or so. For more information, contact me at 870-575-8138 or nstone@uaex.edu.

Upcoming Events

American Heartland Aquaculture Conference
January 19-20, 2007. Regional trade show and conference. Jointly sponsored by Illinois, Indiana, Kentucky and Missouri aquaculture associations. Rend Lake Resort, Whittington, Illinois. Bart Hawcroft (573) 526-6666

Arkansas Aquaculture 2007
January 25-27, 2007. Annual educational meeting. Sponsored by the Catfish Farmers of Arkansas. Embassy Suites Hotel, Hot Springs, Arkansas. Bo Collins (870) 672-1716 or (479) 437-3081

Arkansas Bait and Ornamental Fish Producers
February 8, 2007. Annual educational meeting. Sponsored by Arkansas Bait and Ornamental Fish Growers Association. Lonoke Community Center, Lonoke, Arkansas. Hugh Thomforde (501) 676-3124

Fish Farming Trade Show and Catfish Farmers of America
February 15-17, 2007. Annual trade show and convention. First time joint event. Perdido Beach Resort, Orange Beach, Alabama. Sponsored by Catfish Farmers of Arkansas, Catfish Farmers of Mississippi, Alabama Catfish Producers and Louisiana Catfish Farmers Association. Mike McCall (601) 206-1600

Aquaculture America 2007
February 26-March 2, 2007. San Antonio, Texas. Early registration ends January 5, 2006. Sponsored by the U.S. Aquaculture Society and the National Aquaculture Association. (760) 751-5005

Stocker Catfish Feed Calculation Chart

Larry Dorman, Extension Fisheries Specialist

One common practice utilized by catfish producers to increase production is to include some stocker size fish, 0.1 lb and larger, when stocking fingerlings. The stocker size fish will most likely reach market size during the same growing season, so some income is generated. The disadvantage, of course, is that stocker fish generally cost more than fingerlings. However, in some instances, producers are able to purchase the stocker fish at costs much below the current market price, making this an attractive option.

Producers who do this are asking the following questions: How much feed will be needed to grow the stocker fish to market size and what is the feed cost per fish? The table below was developed to answer the questions. Table 1 includes fish from 3 to 14 inches and examines the quantity and cost of feed needed to grow fish to market size of 1.5 pounds at an assumed feed conversion ratio (FCR) of 2.5, and feed prices at $230, $250, and $270 per ton, or 11.5¢, 12.5¢, and 13.5¢ per pound, respectively. Table 1 does not take into account interest or other costs associated with feeding. Only one FCR is used in the calculation. Using multiple FCR's would make the table difficult to read.

Table 1 shows that a 3 inch fish weighs 0.009 pounds and will need an estimated 3.73 pounds of feed to reach market size of 1.5 pounds. This will cost the producer 42.9 cents to 50.4 cents depending on feed price. The current market price for three inch fingerlings is approximately 3 cents each. At a harvest size of 1.5 pounds, this fish will be worth $1.20 when sold to the processor at 80 cents/lb. Feed cost (42.9 to 50.4 cents/fish, from Table 1) plus the cost of fingerlings (3 cents/fish) comes to 45.9 to 53.4 cents per fish. This scenario shows good profitability, with fish harvested at 44.4 to 49.4 cents per pound above costs invested for feed and fingerlings. As an example, the 49.4 cents per pound was calculated as follows: $(1.20 - 0.429 - 0.03)/1.5lb.

Use Table 1 to calculate feed costs for growout of fish purchased at various sizes. For example, a 14 inch fish weighs approximately 0.85 pounds, and will require 1.63 additional pounds of feed to reach market size. Feed cost (18.7 to 22.0 cents/fish) plus stockers (59.5 cents/fish at current market price) comes to 78.2 to 81.5 cents per fish. In this case the profit margin is 25.7 to 27.9 cents per pound above the cost of feed and stockers. This is not nearly as profitable as purchasing and growing the smaller fish, but with fish in the pond for less time it is somewhat less risky.

Now consider fish purchased at a "fire sale" price. If 14 inch stockers are purchased at only 50 cents per pound, they cost 42.5 cents each. Fed to market size, they would cost you 61.2 to 64.5 cents each, so the margin of profit will be 37 to 39 cents per pound at harvest. Again, this is not as profitable but not as risky as growout of smaller fish.

Producers are invited to contact the author for assistance with evaluation of other scenarios.

Table 1. Feed Calculation Chart. All calculations are based on a feed conversion rate of 2.5.

Length (inches)	Pounds per 1,000	Pounds per fish	lbs feed to 1.5 lbs	Feed cost (¢/lb) at $230/T	Total feed cost (¢/fish)	Feed cost (¢/lb) at $250/T	Total feed cost (¢/fish)	Feed cost (¢/lb) at $270/T	Total feed cost (¢/fish)
3	9	0.009	3.73	11.5	42.9	12.5	46.6	13.5	50.4
6	59	0.059	3.60		41.4		45.0		48.6
9	187	0.187	3.28		37.7		41.0		44.3
12	509	0.509	2.48		28.5		31.0		33.5
14	850	0.850	1.63		18.7		20.4		22.0

Understanding Electrical Costs of Electric Paddlewheel Aeration on Catfish Farms

Steeve Pomerleau, Extension Aquaculture Specialist

Introduction

During summer nights catfish farms rely on fixed electric paddlewheel aeration to supply the dissolved oxygen needed to keep fish alive. But many farmers do not have a clear understanding of the electrical cost of running their aerators. The following information is presented to help sort out the various items on which billing is based, and to offer suggestions on measures to help control and reduce electric utility bills. Cost estimates are based on the 2005 Entergy Arkansas rate schedules and on aeration data collected on commercial catfish farms during the 2004-2005 Catfish Research Verification Program.

Rate Schedules

Entergy Arkansas has two main rate schedules that may apply to fish farms and fixed electric paddlewheel aeration - the General Farm Service (GFS) and the Agricultural Water Pumping Service (AP). The account to which a piece of equipment is connected determines the rate schedule, and monthly electricity costs for aeration vary accordingly. However, the differences in costs are low when both rate schedules are compared on an annual basis.

General Farm Service (GFS)

The GFS rate schedule has six main components: 1) customer charges, 2) demand charges, 3) energy charges, 4) minimum charges, 5) fuel and purchased power costs, and 6) taxes.

Customer Charges - Customer charges are fixed charges that account for approximately 2% of total annual electricity costs of aeration.

Demand Charges - Demand is the rate at which energy is used, measured in kilowatts (kW). The demand is important to the utility company because it determines how much equipment the utility has to supply in terms of transformers, wire and generation capability, to meet a customer's maximum requirements. The demand charges are not influenced by the total number of hours paddlewheels have been running throughout the month, but by the *highest number* of paddlewheels that have been running simultaneously during the month. The higher the number of paddlewheels running simultaneously during the month, the higher the demand charges. Demand charges represent about 14% of total annual electricity costs of aeration.

Energy Charges - Energy refers to the total amount of electricity used during the billing period, measured in kilowatt-hours (kWh). Energy charges account for approximately 46% of total annual electricity costs of aeration.

Fuel and Purchased Power Costs - Fuel and purchased power costs are based on the cost of fuel used to produce power during a given period. Fuel charge adjustments are usually based on a unit charge per kilowatt-hour. On an annual basis, fuel and purchased power costs represent approximately 24% of total annual electric costs of aeration

Minimum Charges - Minimum charges are based, for the most part, on the transformer capacity, in kVA. The number and size of transformers must be sufficient to meet a customer's maximum demand. For example, to supply four ponds with two 10-hp paddlewheel per pond, which correspond to a maximum demand of approximately 60 kW, the system would be equipped with at least 50 or 75 kVA of transformer capacity. Minimum charges are based on a unit charge in $/kVA of transformer capacity, plus the fuel and purchased power cost. Therefore, if the sum of customer charges, demand charges, energy charges, and fuel charge adjustments is smaller than the minimum charges then the customer's bill will only include the minimum charges. On an annual basis, minimum charges represent approximately 7% of total annual electric costs of aeration.

Agricultural Water Pumping Service (AP)

The AP rate schedule is designed in a way to encourage customers to control their demand to reasonable levels during a selected period of the year. For billing purposes, the calendar year is divided into three seasons:

1) Pre-season (March, April and May)
2) Peak season (June, July, and August)
3) Post-season (September through February)

The computation is relatively complex. The most important thing to remember is that the highest demand (in kW) registered during the peak months will affect the energy charges for all the following months of the year. The AP schedule has a high and a low rate for electricity (in $/kWh). The rate is determined by the demand recorded during the peak months. The higher your demand in the peak months, the more you will pay for electricity for all the remaining months of the year.

The best way to reduce electric bills is to reduce the electrical demand during the peak season months. Demand can be reduced by turning off the well at night before turning on the paddlewheels. However, not using the well at all during the peak months would be the best way to reduce electric bills under the AP rate schedule.

Electricity Cost of Aeration

The electricity cost associated with aeration of commercial catfish ponds was estimated between $0.07 and $0.09/kWh, depending on the rate schedule and aeration patterns. The electricity cost to operate a 10-hp paddlewheel for one hour was estimated between $0.52 and $0.67/hour. These estimates are only for electricity. They

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do not include costs for equipment, installation, maintenance, or depreciation.

Reducing your Electric Bill

There are measures to control and reduce electric utility bills. If an electric account supplies numerous paddlewheels and a well, demand charges will be reduced by turning off the well at night before turning on the paddlewheels. Additionally, if possible, avoid using the well during the peak months of June, July and August (or the months of July, August and September, depending on the billing cycle).

Another important aspect of pond aeration concerns the amperage drawn by an electric motor. The amperage and kilowatts drawn by paddlewheels have a direct effect on the electric bill and the costs of electricity per hour of aeration. Floatation devices sometimes corrode and develop leaks, particularly in the high salt areas of Chicot County. This causes aerators to run deeper and thus draw excess amps. The increase in demand will increase the electric bill proportionally. For example, if the demand of all paddlewheels on a circuit increases over time by 7%, from 7.5 to 8.0 kW, the electric bill and the costs of electricity per hour of aeration will increase at approximately the same rate. Therefore, to reduce electricity costs of aeration, pay attention to paddle depth and ensure that all paddlewheels are well maintained and are operating at their optimal and most efficient level. Aerators must draw no more than 90% of the ampere load rating. This amperage usually coincides with a paddle depth of 4 inches. One may easily measure the current drawn by a paddlewheel with an amp meter that clamps around the wire.

Conclusion

Rate schedules and charges vary among electric companies and cooperatives. Therefore, the cost estimates presented here may be different from what you observe on your farm. However, the basic principles on how to reduce electricity charges usually remain the same. For more information on the subject, contact Steeve Pomerleau at 870-575-8139.

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