



CHINA LP NEWSLETTER

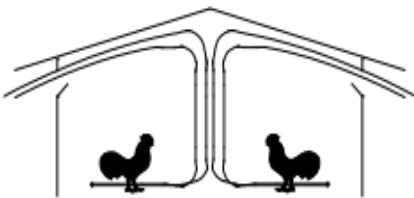


DO IT, DREAMS BECOME A REALITY!

Issue 7

March 30, 2012

THIS NEWSLETTER FOR TYSON CHINA LP TEAM MEMBERS



The purpose of this newsletter is to provide weekly timely information concerning live production. The articles will address frequently discussed subjects and are to be shared with all Tyson China LP team members.

本通讯的目的是每周将有关活禽生产的信息及时地传递给泰森中国活禽团队的所有成员，所涉及到的内容主要为生产中经常会碰到的问题。

Ten Steps to Drier Houses and Good Paw Quality

保持鸡舍干燥的十步曲及如何保持良好的脚爪质量

Cold weather has arrived. Managing broiler houses in cold weather shifts us into a much lower ventilation rate than in warmer weather. Our goal in cooler weather is to ventilate for moisture control and air quality. Done right, this will improve many other aspects of the bird environment, such as ammonia exposure and litter quality. However, if we get behind on ventilation, houses and litter can get wet very quickly. The key to good litter moisture management is to start the flock off with good litter moisture levels and run increasing ventilation as the flock progresses to keep up with the moisture that is being deposited daily by the birds. It is that simple.

冬季来临后，相较于温暖的季节，我们对肉鸡舍的管理转向了较低的通风率。寒冷季节里我们的目标是通过通风来控制舍内氨气和空气的质量。如果措施的当，这可以改善鸡舍环境的其他很多方面，例如：氨气和垫料质量。然而，如果通风管理跟不上，鸡舍环境和垫料将很快变得潮湿起来。管理垫料湿度的关键是：进鸡前鸡舍内的垫料水分含量要达到标准，然后随着鸡只的生长，增加通风来移除鸡群每日排泄的水汽。就这么简单。



If we don't keep up with a proper ventilation schedule, things can seem to get out of control very quickly. The house may seem dry enough today, but almost overnight turns slick and wet. When this happens the underlying reason is not that we weren't adequately ventilating for the past 24 hours, it is because we have not been ventilating properly for some time, perhaps five days to a week. During this time moisture has been gradually building up in the litter pack. We don't see it until the litter pack reaches capacity and can't hold any more moisture, so it slicks over.

如果我们没能采取正确的通风方案，形势很快就会变得不可控制。白天鸡舍看起来似乎很干燥，但是夜间将会变得湿滑。当上述情况发生后，潜在的原因不是在过去的24小时内我们通风不够，而是在某一段时间内（或许是5天，也可能是7天）我们没能进行正确的通风。在这段时间内，垫料开始逐渐地积累水分。在垫料含水量达到饱和和不能再吸纳水分前我们通常是不会发现这个问题的，因此垫料将变得很湿滑。

Many growers now rely on humidity meters to help in monitoring litter moisture. Keeping house relative humidity between 50% and 70% by ventilation for moisture removal, in most cases will move enough moisture out of the house to keep the litter from getting too wet. Managing litter moisture during the flock with good ventilation rates reduces wetness, ammonia, slicking, and foot pad problems. Since the US industry has found a profitable market for quality paws, keeping these paws in good condition is another reason to manage ventilation and litter quality.

很多养殖户现在通过湿度仪来监测垫料湿度。通过通风移除湿气使鸡舍的相对湿度保持在50%~70%，在大多数情况下这样就可以将足够多的水分从鸡舍中移除出去，从而防止垫料变得过于潮湿。饲养期间通过良好的通风率来管理垫料，可以降低垫料的湿度、氨气和脚爪问题。自从美国养禽业发现了高质量脚爪具有广泛的市场前景，保持良好的脚爪成为了做好通风和垫料管理的又一原因。

Every grower and flock supervisor knows that when ventilation fans are run in cold weather it causes brooders and heaters to run, which increases fuel costs. It is somewhat less immediately obvious that failing to provide enough ventilation can also be very costly in terms of lowered flock health and performance brought on by problems caused by excessive wetness of the house.

养殖户和养殖主管都知道在寒冷季节运转风机进行通风时，同样也会导致育雏伞和加热器的运行。这样就会增加燃料成本。从降低鸡群健康和因鸡舍过度潮湿所引起的生产性能下降这个角度来说，因通风不充分所导致的成本升高却不是那么显而易见的。

For every pound of feed a bird eats, it will drink about a quart of water. Only about 20% of that water is retained and goes into bird growth. The rest of the water goes through the bird, most of it into the litter in the form of manure, but a part enters the air through respiration. This means a large amount of moisture is being added to the house, mainly in the litter, and this amount increases every day as the birds grow.

鸡只每吃掉1磅的饲料，将会喝掉大约1夸脱的水。这其中大约有20%的水分被截留在体内用于机体的生长发育，剩下的水分将从机体内流失。而流失的大部分水分将以粪便的形式进入垫料，但是也会有一部分水分通过呼吸作用进入到空气中。这就意味着有相当的水分进入鸡舍里（主要是进入垫料中），并且随着鸡只的生长每天都在增加。



Essential Facts Managers Should Understand About Moisture Management

关于鸡舍湿度管理肉鸡经理们必须要了解的一些事实

1. For every pound of feed a bird eats, it will drink about two pounds (about a quart) of water. Only about 20% of that water is retained and goes into bird growth. The rest of the water goes through the bird, most of it into the litter in the form of manure, but a part enters the air through respiration. This means a large amount of moisture is being added to the house, mainly in the litter, and the amount added each day increases throughout the grow-out. During week one, a thousand birds may add around 1.5 quarts per hour; during the 7th week, they may add around 11 quarts per hour. Figure 1 shows typical amounts of water added to a house by 24,000 birds during a 7-week grow-out. Note that in this example, the estimated amounts of water added to the house daily follows the bird growth curve, ranging from about 200 gallons/day in week 1 to almost 1,600 gallons per day during week 7.

鸡只每采食1磅(0.45kg)的饲料将会喝掉2磅(大约1夸脱)的水。其中仅有大约20%的水分会截留在机体内用于鸡只的生长发育,剩下的水分将从机体内流失,而流失的水分大部分将以粪便的形式进入垫料,但是会有一部分水分通过鸡只的呼吸作用进入空气当中。这就意味着有相当的水分进入鸡舍内。这些水分主要是进入垫料内,并且在养殖期间随着鸡只的生长,鸡舍内的水分每天都会增加。第一周,规模为1000只的鸡群每小时将向鸡舍内排泄1.5夸脱(1.7L)的水分;而到了第7周,鸡群每小时将向鸡舍排泄大约11夸脱(12.5L)的水分。图1是一个典型的例子:它显示了一个饲养周期为7周的鸡群(24,000只鸡)通常将向鸡舍内排泄多少水分。请注意在本例中,鸡群每日排泄到鸡舍的水分几乎紧随着鸡只的生长曲线而变化,从第1周的每天200加仑(0.76m³)增加到第7周的每天1,600加仑(6.06m³)。

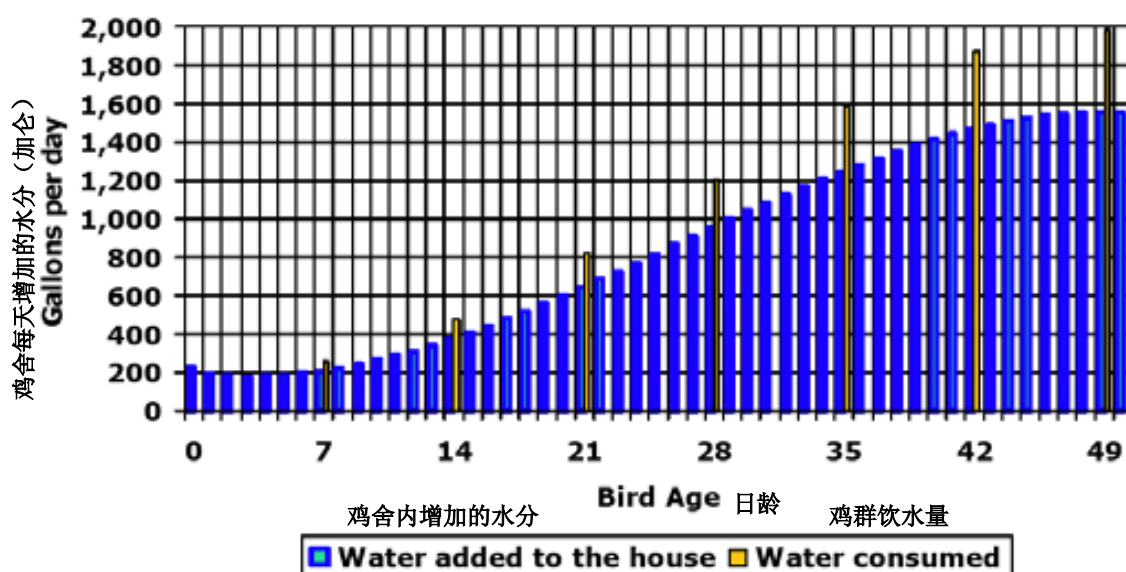


Figure 1. Approximate Water Added to a House During a Growout by 24,000 Birds

Source: M. Czarick, University of Georgia

图1. 一个饲养周期内24,000只鸡向鸡舍内增加的水分

资料来源: M. Czarick 乔治亚大学

2. The only practical way to remove excess moisture from the house is through ventilation. To understand how ventilation air can carry water out of the house even in cold, rainy, or snowy weather requires understanding of relative humidity (RH). The amount of moisture a given volume of air can hold varies considerably according to the temperature of the air. Warmer air can hold much more water than cold air. That is, the moisture-holding capacity of air is relative to its temperature. For example, at 40°F, 1,000 cubic feet of saturated air (100% RH) will hold about 6.3 ounces of water. If we warm that air to 60°F it now is capable of holding almost 12.8 ounces. Since it still contains that 6.3 ounces, it is now holding only half of its total capacity.

This means its relative humidity has been reduced from 100% at 40°F to 50% at 60°F. As a rule of thumb, every 20-degree Fahrenheit (11-degree Celsius) increase in air temperature doubles its moisture-holding capacity.

2. 将鸡舍内过多的水分移除出去唯一实用的方式就是通风。为了更好地理解通风是如何将水分“携带”出鸡舍的（甚至在冷天、雨天或雪天的情况下），我们首先要很好地了解相对湿度（RH）这个概念。随着空气温度的变化，对于一定体积的空气，其含水量会发生相当大的变化。温暖的空气会比寒冷的空气能容纳更多的水分。也就是说，空气的纳水能力与其温度是成正比的。例如：40° F（4.4℃）的情况下，1000立方英尺（28.3 m³）的饱和的空气（100% RH）将会容纳6.3盎司（178.5 ml）的水分。如果我们将其加热至60° F（15.5℃），它将能容纳约12.8盎司（362.8ml）的水分。由于它本身已经含有6.3盎司（178.5 ml）水分，那么现在的这些空气仅容纳了其纳水能力的一半。这就意味着相对湿度（RH）从40° F（4.4℃）的100%上升到60° F（15.5℃）的50%。按照经验法则，空气温度每增加20华氏度（11摄氏度），其纳水量将会增加一倍。



This characteristic explains why warming up cold and wet outside air enables it to absorb moisture from the inside air and the litter. It's the same principle that makes an ordinary clothes dryer work. Figure 2 shows how cold outside air at 30°F and 100% RH will contain 4.3 ounces per 1,000 cu ft, but will have its moisture-holding capacity increased to 24.3 ounces per 1,000 cu ft when it is warmed to 80°F. Its RH would then drop to under 20%, but what happens is that it absorbs another 12.7 ounces of water from the air and litter on its way to being exhausted out of the house at 70% RH (12.7 oz. + the original 4.3 oz = 17 oz, which is 70% of capacity at 80°F).

空气的这个特点阐释了为什么加热进入鸡舍的寒冷潮湿的空气可以使其能够吸收鸡舍内空气和垫料的水分。这和普通干衣机的工作原理是一样的。图2显示的是鸡舍外每1000立方英尺（30m³）的冷空气（30° F/-1.1℃，相对湿度为100%）能够容纳4.3盎司（0.12kg）的水分，但是当其加热到80°F/26.7℃，相同体积的空气其纳水能力将增加到24.3盎司（0.69kg）而其相对湿度将会降至20%以下。因而在被排出鸡舍的过程中可以从空气和垫料里多吸收带走12.7盎司（0.36kg）的水分，从而达到70%的相对湿度（12.7盎司+最初的4.3盎司=17盎司，这是80°F/26.7℃下70%的相对湿度所能吸纳的水量）。

AIR TEMPERATURE 空气的温度							
RH	30°F	40°F	50°F	60°F	70°F	80°F	90°F
10%	0.4	0.6	0.9	1.3	1.8	2.4	3.3
20%	0.9	1.3	1.8	2.6	3.5	4.9	6.6
30%	1.3	1.9	2.7	3.8	5.3	7.3	9.9
40%	1.7	2.5	3.6	5.1	7.1	9.7	13.2
50%	2.1	3.2	4.5	6.4	8.9	12.2	16.5
60%	2.6	3.8	5.4	7.7	10.7	14.6	19.8
70%	3.0	4.4	6.3	8.9	12.4	17.0	23.0
80%	3.4	5.0	7.2	10.2	14.2	19.5	26.3
90%	3.8	5.7	8.1	11.5	16.0	21.9	29.6
100%	4.3	6.3	9.0	12.8	17.8	24.3	32.9

Figure 2. Ounces of Water in 1,000 Cubic Feet of Air at Different Temperatures and Relative Humidities

图2. 1,000立方英尺的空气在不同的温度和相对湿度下所能吸纳的水分（盎司）

Ventilation Management to Control Moisture

通过通风来控制湿度

1. Provide at least enough air volume flowing through the house so that when the air is exhausted it will have picked up sufficient moisture to maintain the house moisture balance at a desirable level. In other words, each day as birds grow and more moisture is deposited into the bedding and exhaled into the air, the ventilation rate must be adjusted to provide the additional ventilation volume needed to remove that moisture. Minimum ventilation rates are based on the amount of moisture added to the house by birds at different ages, as explained above (see Figure 1), and the amount of moisture that a given volume of air can absorb, given its initial temperature and moisture content (outside air conditions) and its moisture-holding capacity (RH) at the temperature it will be warmed to as it is brought into the house (see Figure 2). In practice, instead of continually doing the arithmetic to make such calculations, growers typically rely on tables giving per-bird ventilation rates (cubic feet per minute) needed for moisture removal during each week of a growout, as shown in Figure 3.

使足量的空气流入鸡舍，可以在其排出鸡舍时移走很多的水分，从而鸡舍保持所需的湿度平衡。换句话说，随着鸡只逐日长大，它将排泄出更多的水分到垫料上，呼出更多的水汽到空气中。因而通风率也必须要作出相应的调整以便能提供所需的更多的通风量来移除舍内的湿气。最小通风率的大小是由不同年龄段的鸡只排泄到舍内水分的多少所决定的，就像图1所阐释的那样。一定体积的空气所能吸纳舍内水分的多少与它起始的温度、舍外空气的水分含量和空气流入舍内温度升高后的吸水能力（RH）有关（见图2）。在实际生产中，养殖户通常利用一个表格（见图3），该表格会显示出养殖期间内每周每只鸡所需的通风率（立方英尺/分）而不需要多次进行数学计算。

Figure 3. Example Per-Bird Ventilation Rates for Moisture Removal

图3. 移除鸡舍水分每只鸡所需的通风率

Week 1—0.10cfm	Week 5—0.65cfm
第1周—0.17 m ³ /h	第5周—1.1 m ³ /h
Week 2—0.25cfm	Week 6—0.70cfm
第2周—0.43 m ³ /h	第6周—1.2 m ³ /h
Week 3—0.35cfm	Week 7—0.80cfm
第3周—0.6 m ³ /h	第7周—1.36m ³ /h
Week 4—0.50cfm	Week 8—0.90cfm
第4周—0.85m ³ /h	第8周—1.53m ³ /h

Ventilation rates shown in Figure 3 would be considered more than adequate in the Southeast U.S. for outside temperatures ranging from 30°F to 60°F, and could be adjusted 10-20% lower for lower outside temperatures, and 10-20% higher for higher outside temperatures. Good litter conditions would also allow ventilation rates to be slightly lowered. The total ventilation rate needed is given by simply multiplying the per-bird rate times the number of birds in the flock. Since during minimum ventilation, a small number of fans are normally cycled on and off, the percentage of time they would need to run to provide the total ventilation rate needed is given by dividing the total cfm's needed by the cfm capacity of the fans being used.

图3所示的通风率对美国东南部（其外界温度在30°F/-1.1℃到60°F/15.6℃范围内波动）来说已经绰绰有余了。若鸡舍外温度更低的话，可以将通风率降低10-20%；若外界温度更高的话，通风率可以提高10-20%。良好的垫料即使通风率稍微降低一点也没问题。可以简单地将每只鸡的通风率乘以鸡只的数目得到需求的总通风率。在最小通风期间由于少数的风机通常会循环地开关，可以通过将所需的总的cfm除以风机的cfm而得到为满足所需的总通风率而要运转风机的时间。

For example, in a house with 20,000 birds during week 2, the ventilation rate needed is 0.25 cfm X 20,000 = 5,000 cfm. If the fans to be used have a combined capacity of 30,000 cfm, then the fans need to be run one-sixth of the time or 5,000 cfm ÷ 30,000 = 0.167. Using a five-minute timer, this would mean fans would be on for 50 seconds (0.167 X 300 seconds = 50 seconds)

例如：第2周龄的鸡舍（含有20,000只鸡），所需的总通风率是0.25cfm×20,000=5,000cfm。如果风机总通风能力为30,000cfm，那么风机在一个循环周期内会运转1/6的时间（或者是5,000cfm÷30,000=0.167）。将通过定时器将循环周期设定为5分钟，这就意味着一个循环周期内风机需要运转的时间是50秒（0.167×300秒=50秒）

Although ventilation rates determined as explained above are extremely helpful, managers must realize that they provide only a starting point for effective ventilation management for moisture removal. Monitoring the house to keep track of actual conditions and modifying the ventilation rates to suit those conditions are essential to achieving top flock performance and reducing the incidence of Food Pad Dermatitis. Managers are well advised to have and use a high-quality hand-held humidity meter (humidistat or hygrometer), as well as visually and physically inspecting the barn and litter for signs of increasing wetness. It is paramount to remember that by the time wet litter is observed, conditions favoring Food Pad Dermatitis have been developing for several days.

尽管上面的阐释对确定通风率有极大的帮助，我们的经理还必须认识到这只是为通过有效通风降低舍内湿度提供了一个良好的开端而已。通过监测鸡舍环境来跟踪其实际的状况并更改通风率来满足现实需求对获得鸡群最优的生产性能和降低足底皮炎发生率是非常关键的。我们的经理要拥有并使用高质量的手持式湿度计（温度调节器或湿度表）及肉眼观察和亲自体测鸡舍内环境和垫料水分增加的表征是非常明智的。首先要记住的是当垫料已经能观察到比较潮湿的时候，会在未来的几天内形成足底皮炎。

2. Manage ventilation airflow so incoming air is conditioned before making contact with birds or litter. Cold air in contact with warm litter does a very poor job of removing moisture from the litter. Incoming minimum ventilation air must be brought into the house high, through either ceiling/attic inlets, ridge inlets, or perimeter inlets at the top of the wall. Air also must be directed across the top of the house at sufficient velocity so that it will mix with warm house air before making contact with birds or litter.

通过管理通风的气流可以让进入的空气达到所需的条件后再吹向鸡只或垫料。冷空气接触到温暖的垫料后不能将垫料上的水分带走。经最小通风流入鸡舍的空气通过天花板/阁楼小窗、屋脊小窗或墙壁顶端周形小窗的引导流向鸡舍顶部。同时这些空气也要有足够的流速，以便于在接触到鸡只或垫料前能够和鸡舍内的暖空气进行混合。

Figure 4 shows an adequate minimum airflow pattern, with cold outside air coming in through perimeter inlets warming and drying as it travels across the top area of the house, then picking up moisture from the lower part of the house. Note that air movements and mixing in the house will be more complex than can be shown in this simplified graphic, and that in the US and in Europe there are several variations of minimum ventilation inlet arrangements (some fan-assisted) in use. What they all have in common is keeping incoming air high in the house and drying it out as it is warmed by thorough mixing with the inside air.

图4显示了一个充足的最小气流，鸡舍外寒冷的空气通过小窗的四周进入鸡舍内，在气流流向鸡舍顶部的过程中被加热和干燥，然后在鸡舍下部移除水分。请大家注意的是鸡舍内空气流动和混合要比简图所显示的复杂的多。在美国和欧洲所用的最小通风小窗的布置各不相同（有些还有风机辅助）。但它们的共同点就是让进入的空气能够抵达鸡舍的顶部，通过与鸡舍的空气进行充分混合而变得温暖干燥。

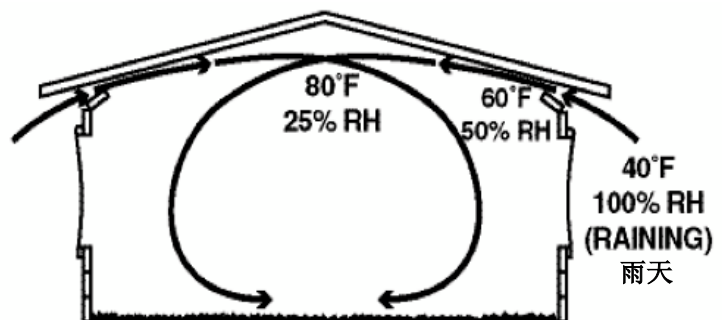


Figure 4. Minimum Ventilation Airflow to Achieve Adequate Conditioning of Air

图4.通过最小通风来满足鸡舍内所需的空气质量

TEN STEPS TO DRIER HOUSES AND GOOD PAW QUALITY

保持鸡舍干燥的十步曲及如何保持良好的脚爪质量

1. Run heating and ventilation to keep house air relative humidity at 70% or lower in cold weather. Get a relative humidity (RH) meter and use it. Humans cannot judge relative humidity very well. Start your flock with sufficient litter that has been conditioned and is not wet.

在寒冷的天气里，运行供暖和通风系统来保持鸡舍空气的相对湿度在70%或低于70%。获得一个湿度计，然后用它去测量鸡舍的RH。人类的感官器官通常不能很好地判断出相对湿度的大小。进鸡前确保鸡舍内含有充足的、质量良好的、不潮湿的垫料。

2. Check your air inlet openings and static pressure. A modern house relies on the proper inlet opening and the proper static pressure to throw air to the center of the house. In winter, a static pressure of about 0.10 with inlets opened to about 1 to 1-1/2 inches are what is needed. Failure to do this results in poor air mixing.

检查进风小窗的开口和静态压。现代的鸡舍依靠通风小窗正确的开口大小和正确的静态压来将空气导入到鸡舍的中央。冬季的时候，我们需要的鸡舍的静态压是0.10左右，进风小窗开放约1-1.5英寸。

3. Check your house for cracks and air leaks. Since cold air falls and warm air rises, cold air coming in through a crack or around a curtain will drop straight to the floor. Stop up all cracks. This reduces sweating and litter caking, and improves the bird environment.

检查鸡舍是否有裂缝和漏风。由于冷空气下沉、热空气上浮，通过裂缝或通风小窗周围流入的冷空气将会跌落到地面上。因此要密封所有的裂缝。这样可以减少鸡舍内“出汗”和垫料结块等现象，并且能改善鸡舍环境。

4. Consider using stir fans. The more we can stir the air without causing drafts on the birds the better able the air is to pick up litter moisture. Stir fans also lower heating costs.

考虑使用搅拌风扇。搅拌空气的次数越多（注意要避免引起贼风对鸡只产生侵袭），空气就越能够带走垫料的水分。搅拌风扇同样也会降低供暖成本。

5. Take a hard look at your tunnel inlet and end doors. Most tunnel inlets are not sealed well enough. Consider a flap, an interior curtain, or other cold air barrier. Cold air leaking in at the tunnel inlet end causes sweating, condensation, and cake. Sealing this up is the solution to this problem.

仔细查看进风口和末端的门缝。大部分纵向进风口的密封性都不是很好。我们可以考虑加一个悬挂物、内帘或其他能阻挡冷空气的隔离物。发生在纵向进风口末端的冷空气泄漏会引起鸡舍“出汗”、凝露和垫料的结块。密封这些漏缝就会避免上述问题。

6. Take a hard look at tunnel fans. Even the best shutters don't seal perfectly. In very cold weather installing bonnets or plastic over shutters that are not in use is a must, otherwise cold air hits the warm floors and causes condensation and caking.

仔仔细细检查下纵向大风机。即使最好的百叶窗也不能密封得很完美。寒冷天气里必须要在大风机的百叶窗上安装罩子或用塑胶加以密封，否则外界的冷空气将会跌落到地面上，从而引起鸡舍凝露和垫料结块的现象。

7. Take a hard look at your fan run times. Too many folks cheat on fan run times. Insufficient run times lead to higher humidities, sweating, and higher litter moisture.

仔细检查风机运行的时间，已经有太多的人被这个问题欺骗了。风机运行的时间不够将会导致较高的湿度、鸡舍内“出汗”和较高的垫料湿度。

8. Look your ceiling over. If you have wet and dripping spots here and there on your ceiling, most likely you will find places with little or no insulation in the attic. Get into the attic and be sure your insulation has not shifted.

查看你的天花板。如果你的天花板四处都出现脱落的斑点，那么很有可能你将会发现阁楼完全不密封或密封的很少。请进入阁楼检查以确保其密封良好。

9. To stop sweating and fog in the back half of a tunnel house during brooding, quit pulling all the air to the back and exhaust some air from a side wall or front wall fan in the brood chamber. This reduces the amount of moist air going through the back of the house. Also turn on heat in the back of the house to 55-60°F.

在育雏期间，安置在鸡舍的后半部分的喷雾设备请停止喷雾。避免将所有的空气抽到鸡舍的后端，避免侧墙或前墙的小风机将育雏区内的空气排到鸡舍外。这样可以减少进入鸡舍后部的湿空气量。同时打开鸡舍后部的加热器加热鸡舍至55-60°F（12.8°C-15.6°C）。

10. Don't turn your heat off, even if you have big birds. In a cold winter, especially if your house is not very well insulated, you might well need some heat all the way to the end of the grow-out. Turning the heat off places too much demand on bird heat and causes us to load the house with moisture, resulting in heavy sweating and caked litter. Turning heat off also increases feed consumption.

不要关闭供暖系统，即使鸡舍里的鸡只较大的情况下。在寒冷的冬季，尤其是在密封性不好的鸡舍，养殖的全程都需要供暖。停止供暖将会使得鸡只对热量的需求大增，并导致鸡舍内湿气的蓄积，从而引起鸡舍内“出汗”严重及垫料板结。关闭供暖同样也会增加饲料的采食量。

Achieving good minimum ventilation airflow requires proper adjustment of air inlets and maintaining adequate static pressure, typically around 0.10 to 0.12 inches WC. It is the pressure difference between inside and outside that generates enough incoming air velocity (or “throw”) to get good mixing high in the house. For this reason, the house must be “tight,” with no unplanned openings that will allow cold outside air to leak into the house. Such air leaks will result in lowered air velocity through the air inlets and are likely to cause condensation on litter and sidewalls. Common sources of leaks are poorly closing fan shutters, unsealed wall plates, and unsealed tunnel or side-wall curtains.

想要获得良好的最小通风，就要正确地调整进风口的大小并维持充足的静态压（通常大约为0.10-0.12英尺水柱）。鸡舍内外的压力差会让进入鸡舍的空气有足够的风速抵达（或“投射”）至鸡舍的上方并进行良好的混合。正因如此，鸡舍必须要“不漏风”，不会出现意外的孔洞让冷空气吹进鸡舍。这些漏风的地方将会降低通过进风小窗进入鸡舍的空气的流速，并且很容易导致鸡舍内垫料和侧墙出现凝露的现象。常见的易发生漏风的地方有密封性不好的风机百叶窗、不能密闭的墙板、纵向大风机和侧墙小风机。

Additional Considerations

其他举措

In many locations litter moisture can be lowered and humidity reduced through the use of simple stirring or air recirculation fans installed in the top of the poultry barn. Unlike minimum ventilation fans, stirring fans are usually on all the time instead of being cycled on and off, so that they can considerably reduce temperature stratification by keeping in-house air constantly moving. Many variations of stirring fans, which stir approximately 10 to 15% of the building volume and are located in such a manner not to put cold drafts on the birds, have been proven immensely valuable in many areas of the U.S. for reducing foot pad problems.

鸡场可以在鸡舍顶端安装简易的搅拌风扇或空气回流风机来降低垫料湿度和鸡舍内湿度。不同于最小通风的风机，搅拌风扇通常是一直在运转而不是循环地运转、停止。所以通过保持舍内空气不断地流动，搅拌风扇能够在相当程度上降低鸡舍内的温差。很多类型的搅拌风扇都能把鸡舍内大约10%到15%的空气进行混合，安装这些风扇的目的是为了不让冷的贼风吹到鸡只身上。这个极有价值的举措能够降低脚爪问题的发生，并且在美国的很多地区得到了证实。



Figure 5. Stirring fan

图5. 搅拌风扇



Tyson China Live Production Team

The author of this article was Jim Donald, Jess Campbell, Gene Simpson, and Ken Macklin