

Facility design & management issues for mature swine

Ted Funk, PhD, P.E.

Department of Agricultural and
Biological Engineering



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This sow is cool! 这头母猪很凉快!



Gestating Sows: Timing Your Cooling Efforts

1. Most critical days are 1st and 3rd trimesters of pregnancy
 - Embryo losses in 1st trimester due to heat stress
 - Fetal deaths/low birth weight due to late term heat stress also



Water requirements for swine

猪的饮水量

Stage of production 生产阶段	Liters water per day 升水/日	(2.5 - 3.0 L/kg of feed consumed)2.5-3.0升/ 千克饲料
Nursery pigs保育猪	1-8	
Grower Pigs生长猪	8-12	
Finishing Pigs肥育猪	12-20	
Nonpregnant gilts 空怀青年母猪	12-16	
Pregnant sows 妊娠母猪	12 - 25	
Lactating sows 哺乳母猪	12 - 30	

placed at the correct height,
and have adequate flow at all
times. 乳头式出水口位置应具
有合理高度并一直保持充足
水流



Steps for cooling pigs

为猪降温的步骤

1. Must have enough dry, fresh air coming into the building!
必须有足量的干燥新鲜空气进入猪舍
2. Wet the pig's skin
湿润猪的皮肤
3. Let the water evaporate off the skin
让水从皮肤上蒸发
4. Move air with fans if necessary
必要时用风扇吹风
5. Re-wet skin and repeat
再次湿润皮肤，重复上述步骤



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Artificial “wallow” in corner of pen allows pigs to wet themselves for cooling. Shade cloth helps with cooling also.

猪栏角落的人造滚浴池使猪可以自行滚湿降温，遮阴棚也有助降温。

Air Flow Requirement For Each Pig

每头猪的气流需要量(m³/hr立方米/小时)

	Weight, kg 体重(千克)	Cold 冷	Mild 温	Hot 热
Sow & litter 母猪带仔猪	180	34	136	850
Pre-nurs. Pig 断奶前仔猪	5-14	3	17	42
Nursery pig 保育期仔猪	14-34	5	25	59
Growing pig 生长猪	34-68	12	41	127
Finishing pig 肥育猪	68-122	17	59	204
Gest. Sow 妊娠母猪	150	20	68	255
Boar, sow 公猪, 母猪	180	24	85	510

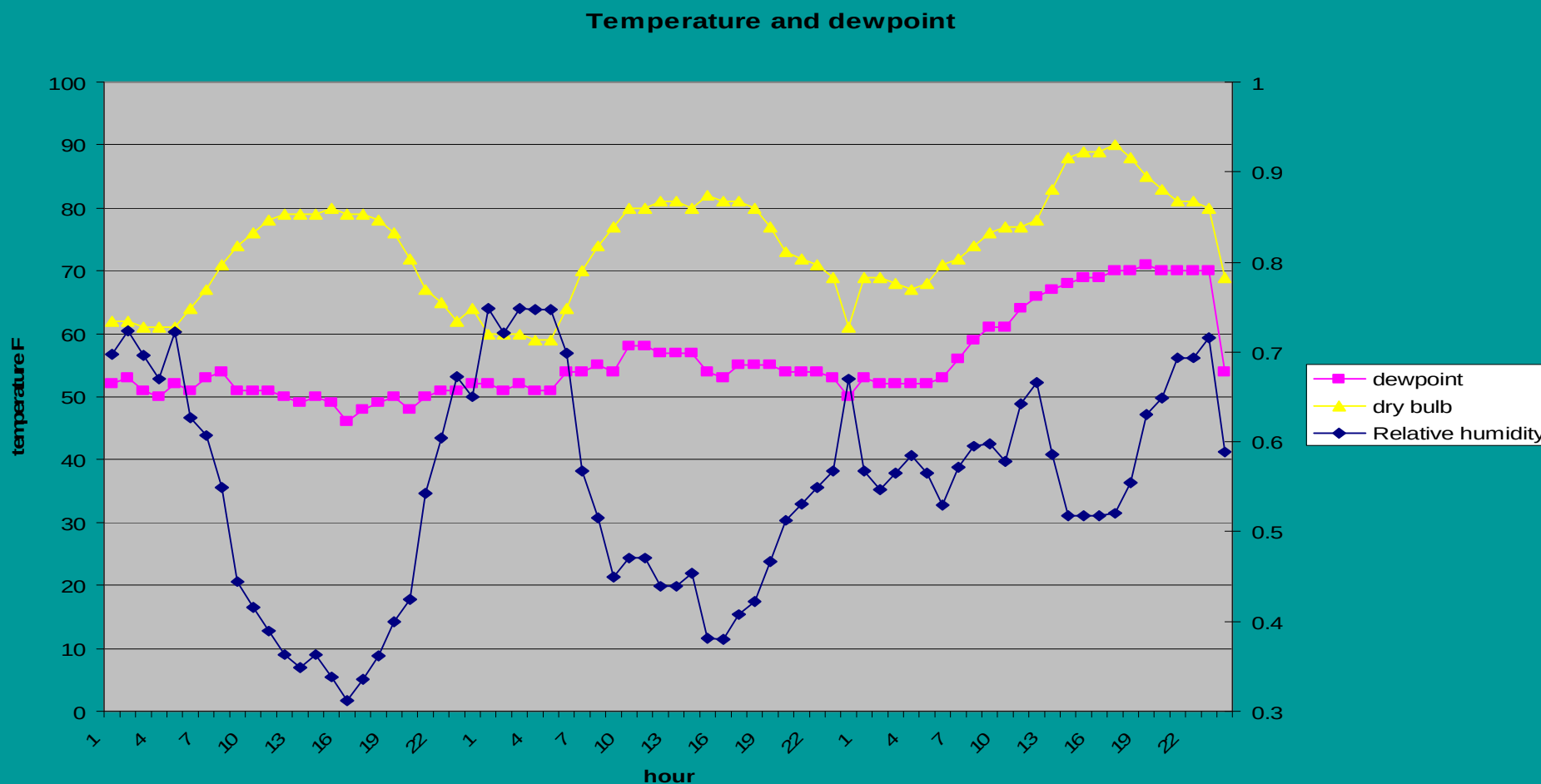


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Daily weather effect: as temperature increases, relative humidity decreases

常天气的影响：相对湿度随温度的上升而下降



Cooling Bad and Good

- (bad) misting or fogging nozzles. The climate is not dry enough for them here.
- 不好:
- 雾化或喷嘴不适于高湿度小气候。
- (good) use large water droplets to wet the skin of the pigs. Then use wind or fans to dry off the water.
- 好:
- 用大水珠淋湿猪皮肤然后用风或风扇吹干水分。



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Sprinkling nozzles are near the sidewalls. Sleeping area and feeders should not be wetted.

喷嘴靠近侧墙，避免猪床和料槽受潮。





Gestation building with “tunnel” ventilation

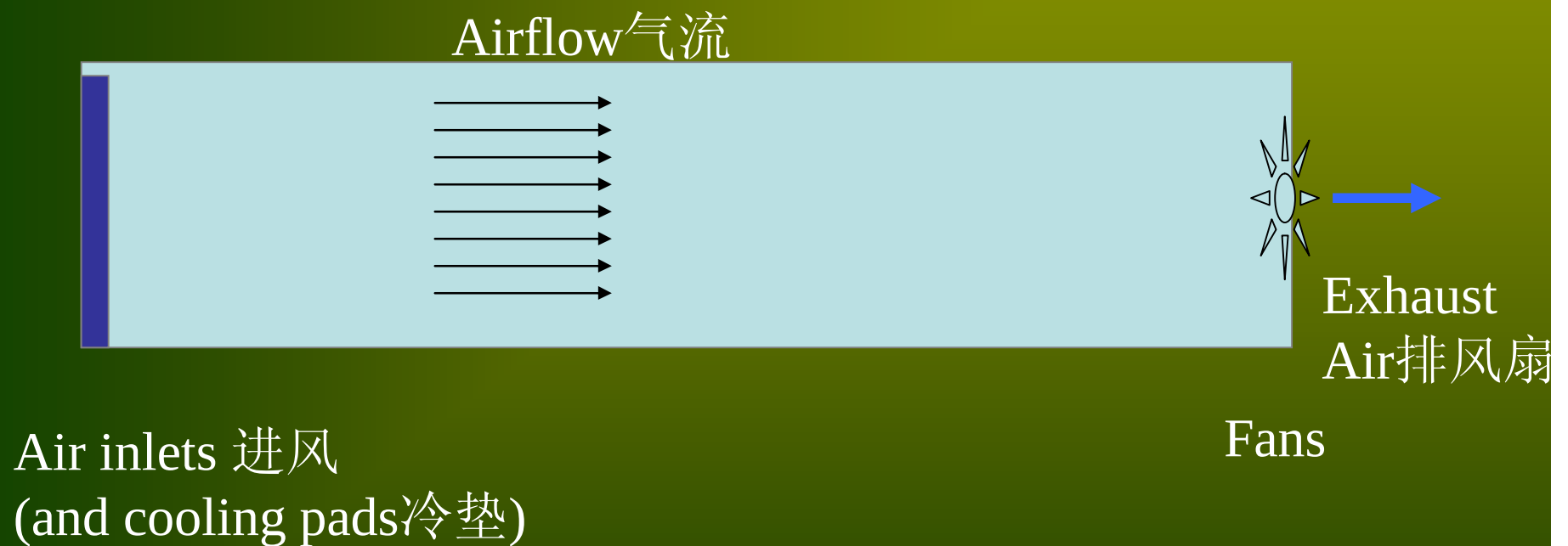
采用纵向(隧道式)通风系统的妊娠母猪舍

Evaporative cooling pad
蒸发降温垫(湿帘)

Building Plan View:

建筑计划 观点

Tunnel Ventilation 隧道通风



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**Circulation fan
types**
循环风扇类型





These gestating sows need extra cooling.

Where could you put a ventilation fan to help the most?

此妊娠母猪舍需加强降温。
在何处设置风扇最有效？

Consider cooling mechanisms for sows lying close together?
如何解决这些紧密接触的母猪的降温？









Tethered gestating sows with water drip cooling

采用滴水降温的拴养妊娠母猪



Water drip emitters for tethered gestating sows

拴养妊娠母猪降温用的滴水器



Narrow building for naturally ventilated gestation unit in a hot climate

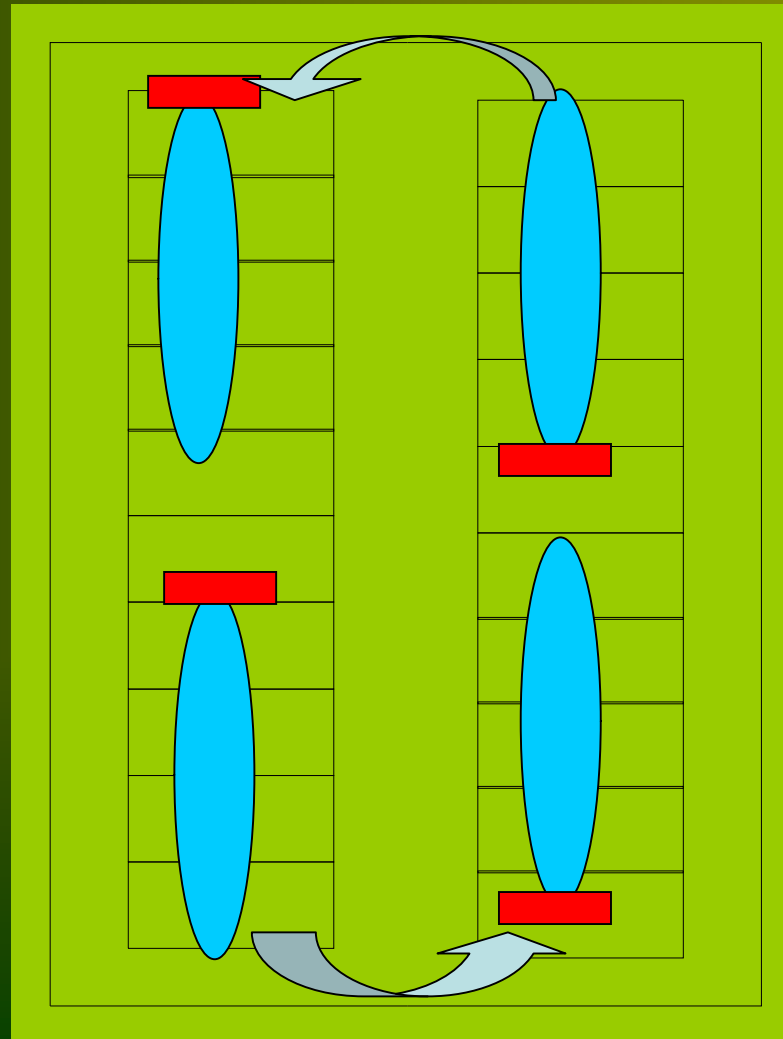
为炎热天气环境中进行自然通风而设计的宽度较窄的妊娠房





Circulating fan placement using a “race track” arrangement. This can be very efficient for cooling, but must have good air exchange with the outdoors also, by using large sidewall openings.

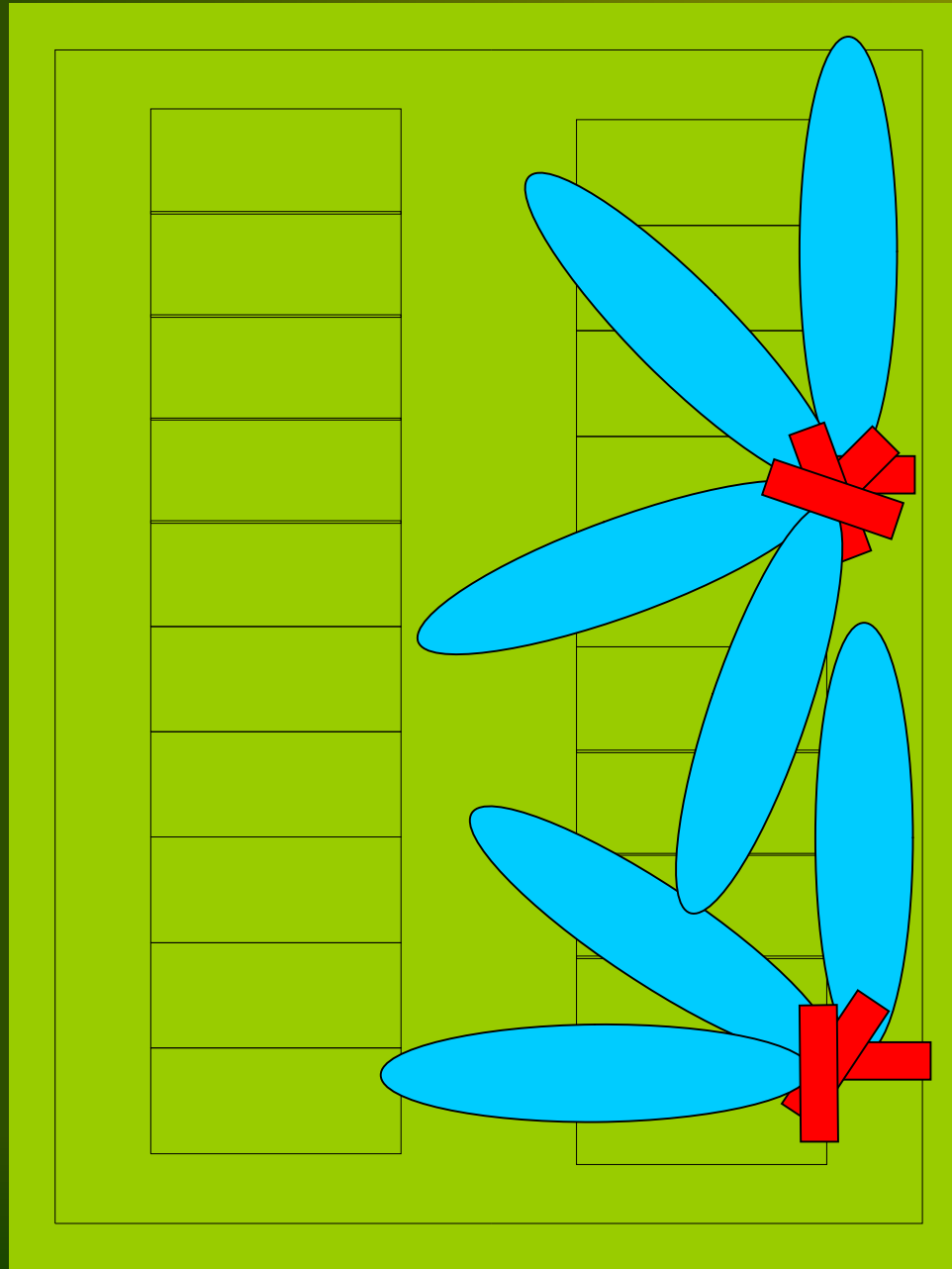
跑道式循环风扇的设置：利用侧墙大开口，在与外界换气良好的条件下可形成非常有效的降温。



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Air flow patterns
for oscillating fans
摇头风扇的气
流模式



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Manually controlled curtain 人工控制的窗帘

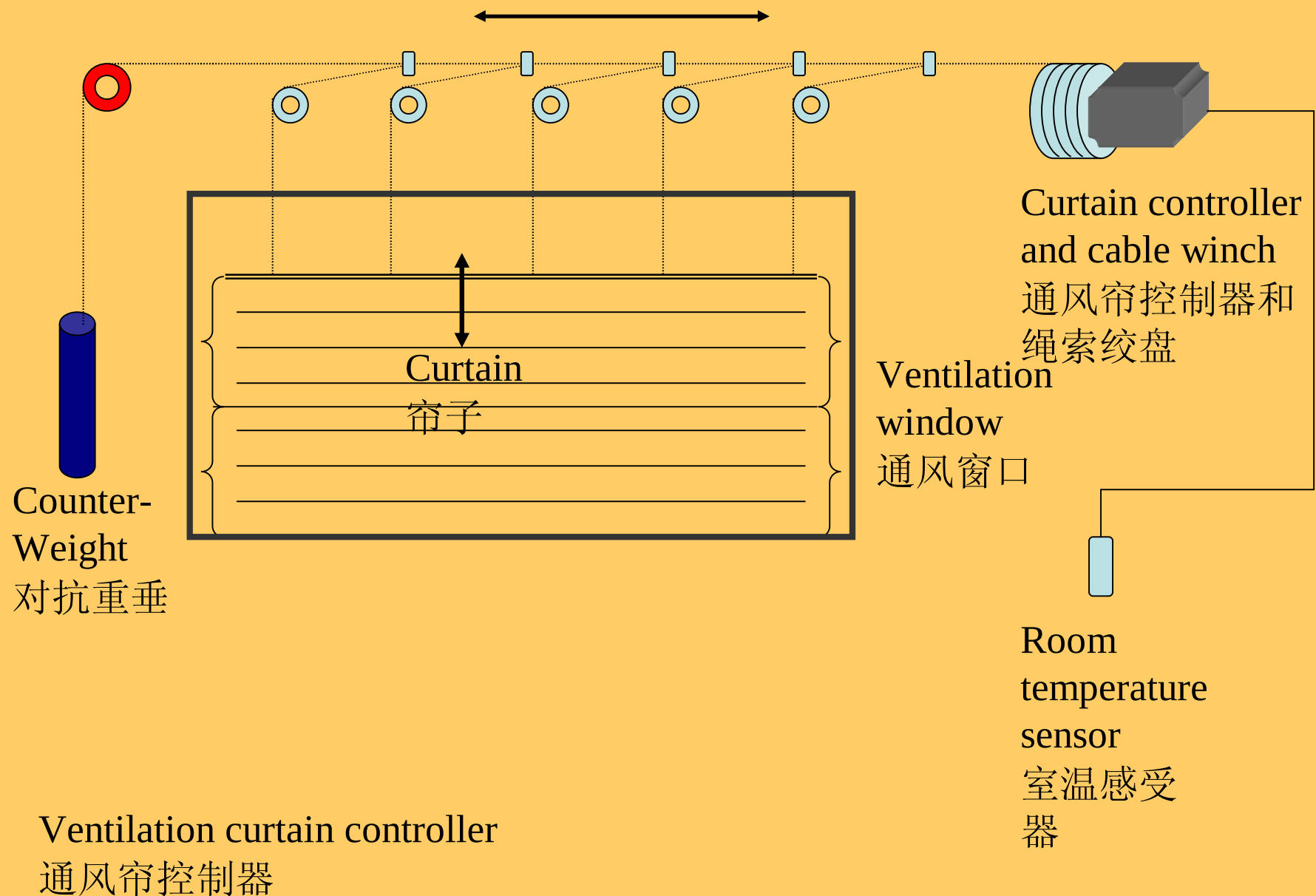


Naturally ventilated buildings benefit from automatic control

自然通风猪舍得益于自动控制



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Clues to heat stress: lactating sows

热应激: 哺乳母猪



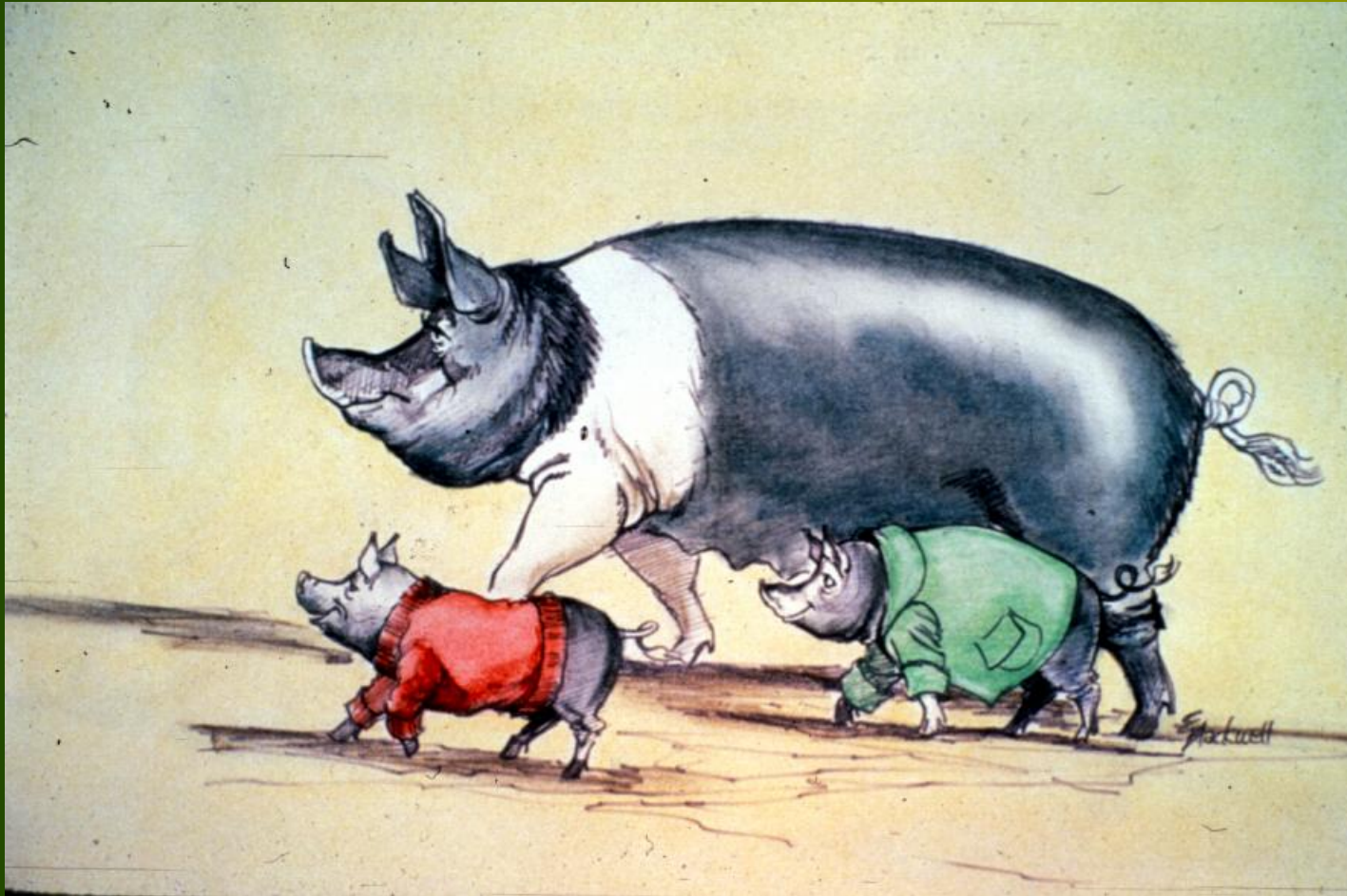
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The sow and her piglets need very different environments

母猪和仔猪需要差异较大的环境



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Farrowing crate showing “zone cooling” tube carrying air for the sow’s head

产床局部降温管给母猪头部送气

Individual cooling air tubes for sows in farrowing

为产房内母猪降温的冷风管

Tube raised to show end





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Cooling Bad & Good

- (bad) water sprinkling or dripping on all the time
- (bad) water in farrowing splashing on piglets
- 不好:
- 不间断喷淋和滴水
- 水淋产床仔猪
- (good) use a time and temperature controller to put just enough water on the skin to get the cooling done
- (good) piglets never get wet or chilled from the sow cooling system
- 好:
- 利用定时定温器保证母猪皮有水分降温即可，母猪降温系统勿使仔猪受潮受寒。



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Drip cooling tube fastened over sow's shoulder area

固定于母猪肩部上方
的滴水降温管

Programmable controller for drip cooling system

滴水降温系统的程序控制器



Water filter and
electric valve
水过滤器 和电
阀

**Programmable controller
for water sprinkling or drip
cooling**

管理喷淋和滴水程序控制器

**Programmable controller
程序控制器**

**Room temperature sensor
室温感应器**

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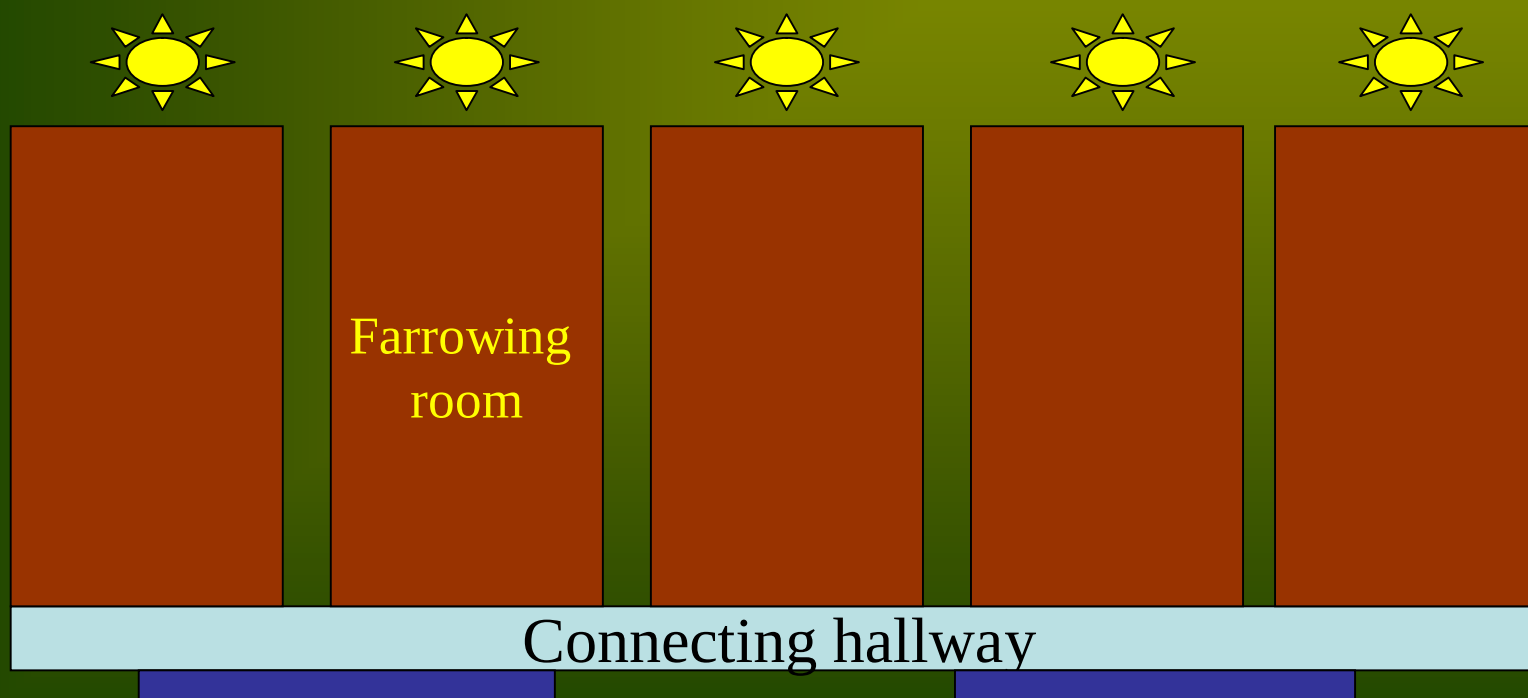
Can we keep the sows and the piglets comfortable?
如何能够让这些母猪和仔猪保持舒服？



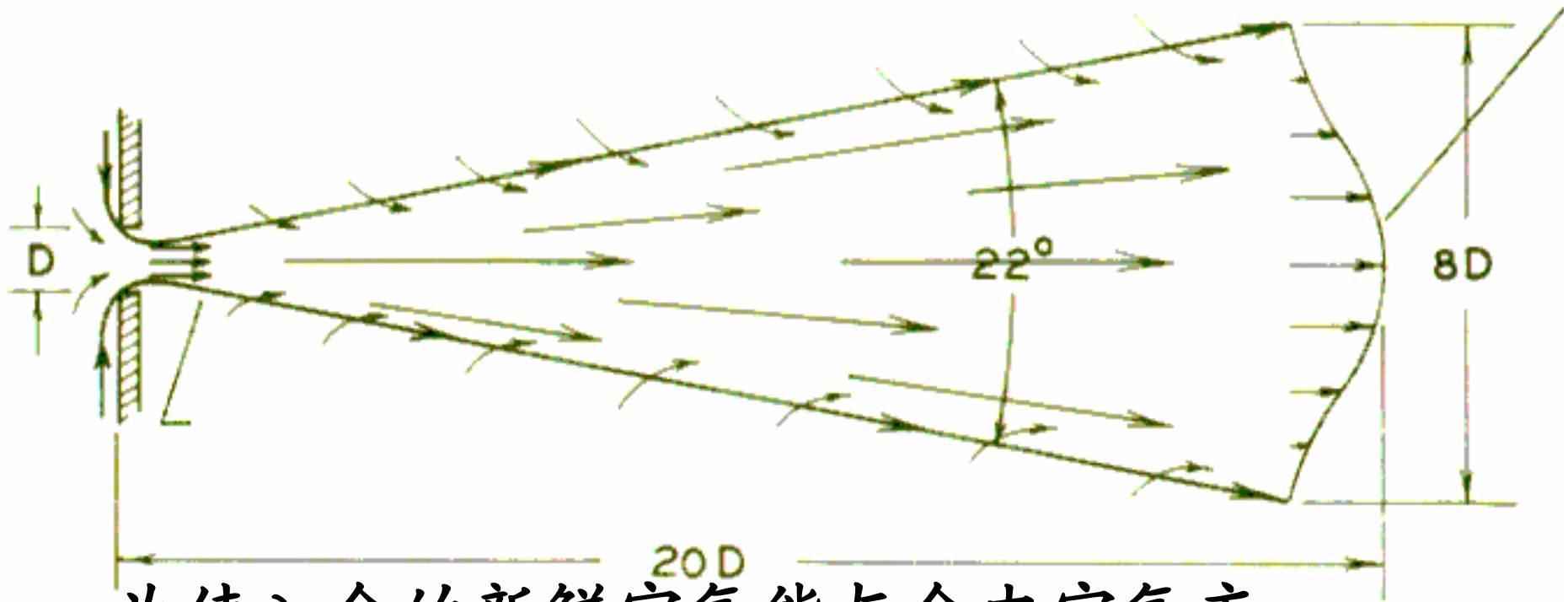


Multiple room farrowing with evaporative cooling

Exhaust fans



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为使入舍的新鲜空气能与舍内空气充分混合，新鲜空气应以喷射方式入舍

For good air mixing, fresh air should enter the room in a “jet”

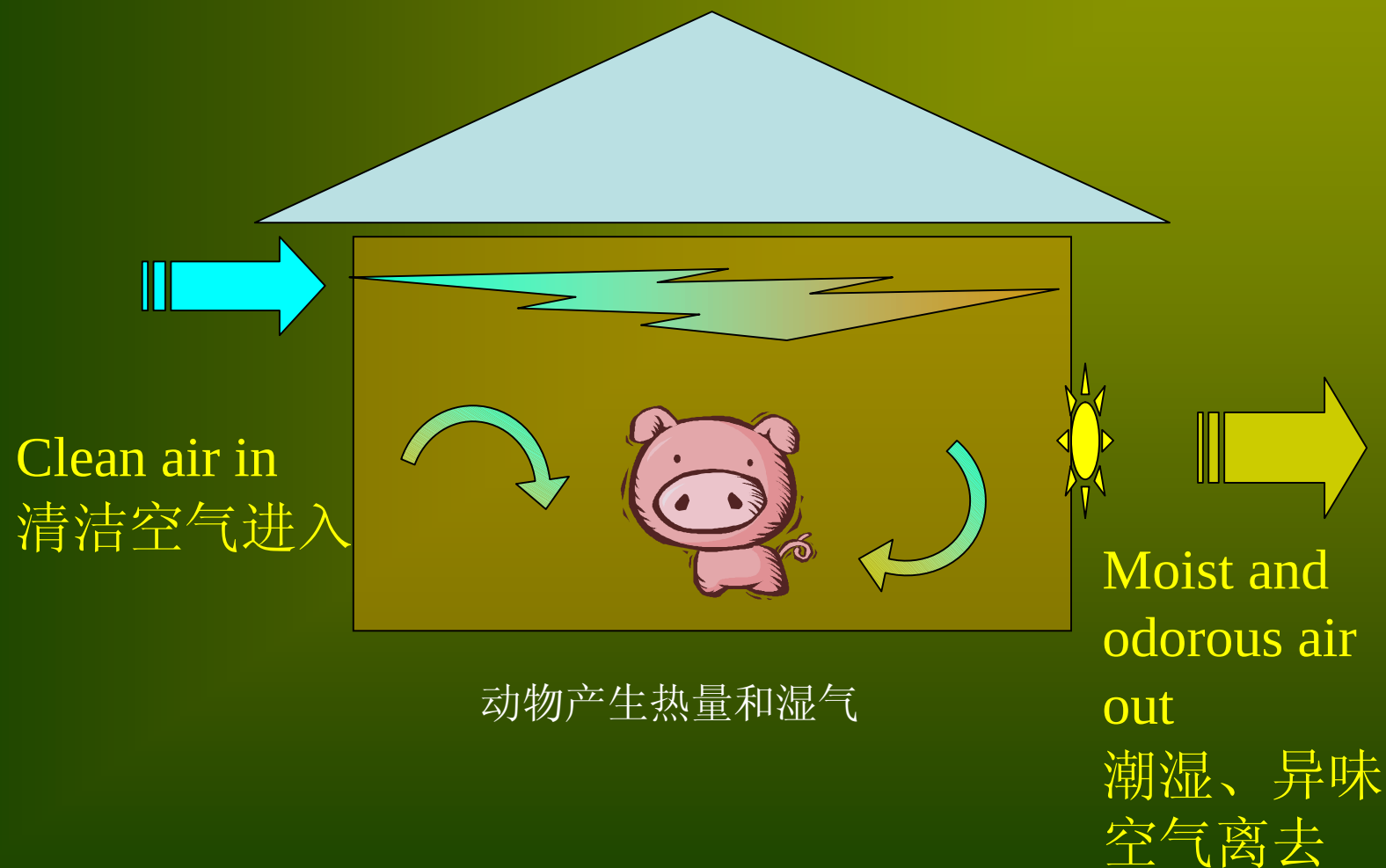


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Airflow in a farrowing room
产仔间的气流

Ventilation process 通风过程



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A photograph of two pigs in a metal-barred enclosure. On the left, a light-colored pig is seen through the bars. On the right, a dark-colored pig stands with its back to the camera, showing its large, prominent pink udders. The floor is wet and reflective. In the background, there are some bags and foliage.

Don't Forget to Cool
Boars

Case study: boar stud, boars are too warm



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Evaporative pad for cooling on a boar housing barn
公猪舍的湿帘降温





Factors that reduce fan performance 导致风扇性能降低的因素

- Drive belt slipping 皮带打滑
- Dirty fan blades 叶片脏
- Dirty or stuck shutters 百叶窗脏或卡住
- Distance between fan blades and housing is too great 叶片和外罩之间的距离太大



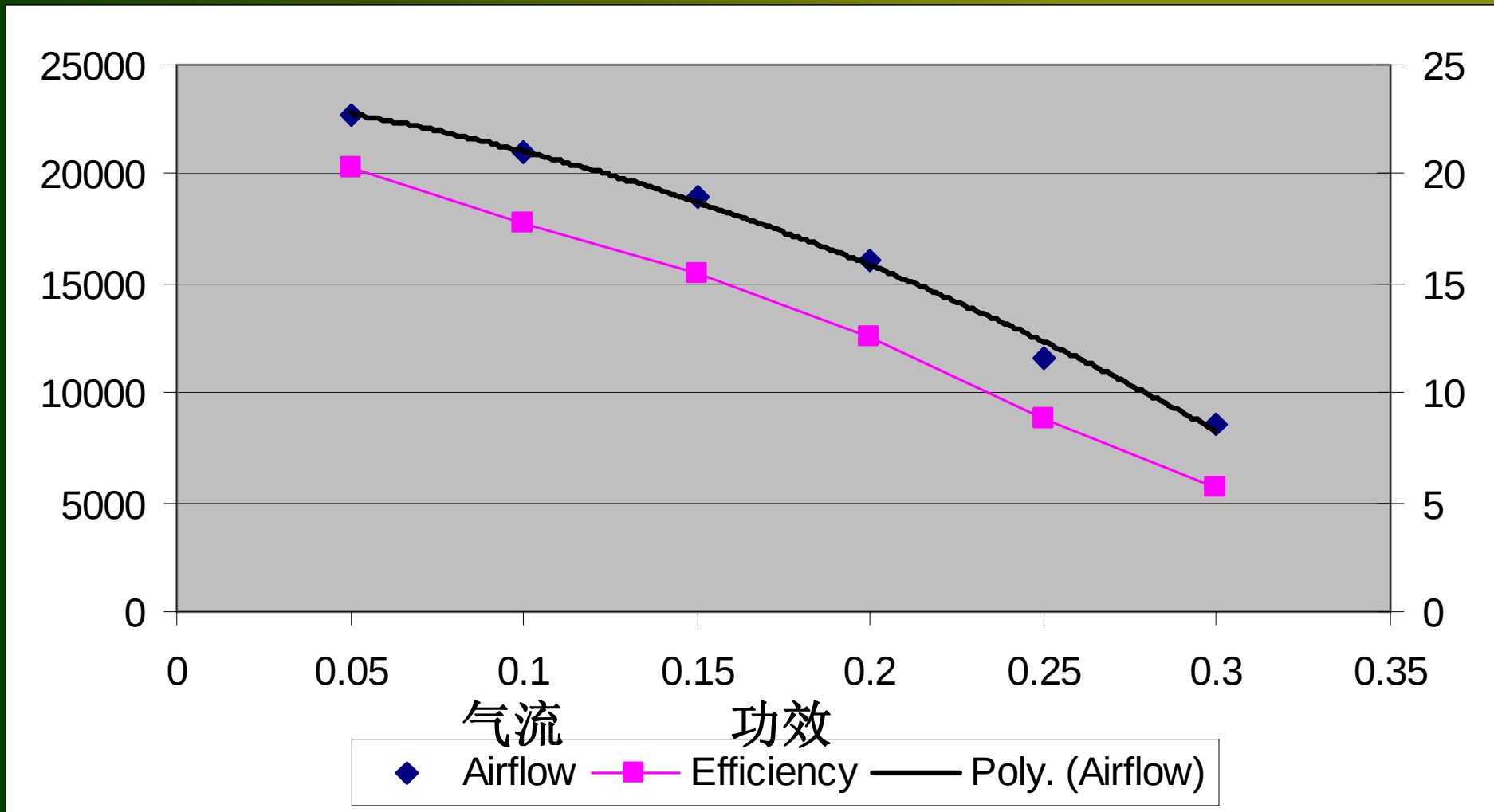






Example Fan: Big Dutchman 50" Fan

风扇举例：大荷兰人 50英寸风扇





Fan Maintenance is Important to
Keep Design Airflow

Summary – Cooling

总结——降温

- Drinking water supply
饮水供应
- Air exchange with the outside
与室外的空气交换
- Air movement on the pig's skin
猪皮肤上的空气流通
- Water on the skin for evaporative cooling
皮肤上水分挥发来降温
- Management
管理



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**Questions or comments on
cooling swine?**

对猪的降温有何问题和评论？



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