HEAT RECOVERY & POWERED VENTS
HEAT RECOVERY VENTING TOPICS

• HEAT RECOVERY DEFINITION
• HOW HEAT IS LOST WHILE DRYING
• HOW IS THE KILN BEING VENTED
• WHERE IS ENERGY CONSUMED
• WAYS TO PREVENT ENERGY LOSS
• POWER VENTING
• HOW HEAT RECOVERY WORKS
• HRV: HOW IT HELPS
• BENEFITS OF HRV
Heat recovery ventilation (HRV), also known as mechanical ventilation heat recovery (MVHR), is an energy recovery ventilation system using equipment known as a heat recovery ventilator, heat exchanger, air exchanger, or air-to-air heat exchanger which employs a cross flow or counter-flow heat exchanger (countercurrent heat exchange) between the inbound and outbound air flow.

~ Wikipedia
HOW HEAT IS LOST WHILE DRYING LUMBER

• VENTED AIR IS HOT – HEAT IS LOST THROUGH VENTING
• AMBIENT AIR ENTERING THE KILN CHILLS THE AIR
• DEPENDING ON LOCATION OF VENTS, THE BUILDING CAN BE CHILLED THUS CAUSING CONDENSATION TO TAKE PLACE
• VAPOR THAT IS CHILLED TO WATER MUST BE REHEATED AGAIN TO VAPOR
• SOMETIMES KILN AIR THAT HAS JUST PASSED THROUGH HEAT COILS IS VENTED
• UNITENTIONAL VENTING – LOSS THROUGH OTHER MEANS

Vranizan, The Benefits From Eliminating Roof Venting in Dry Kilns, 1992
HOW IS THE KILN BEING VENTED

- VENTS OPEN ON WET BULB FOR CONVENTIONAL KILNS
- VENTS OPEN ON DRY BULB FOR DEHUMIDIFICATION KILNS
- HEAT EXCHANGER ONLY FOR MODERATE TO LOW LOAD CONDITIONS 85%
- HEAT EXCHANGER PLUS CONVENTIONAL VENTS FOR MAXIMUM LOAD CONDITIONS (15% +/-).
WHERE IS THE ENERGY CONSUMED IN A KILN WHILE DRYING?

• UP TO 50% OR MORE IS CONSUMED CONVERTING WATER TO VAPOR – HEATING
• HEATING THE LUMBER - HEATING
• AIR CIRCULATION FANS – AIRFLOW
• EQUIPMENT CONTROLS - CONTROLS
• FORCED EXHAUST – POWERED VENTING

Vranizan, The Benefits From Eliminating Roof Venting in Dry Kilns, 1992
WAYS TO PREVENT ENERGY LOSS IN A KILN

• IMPROVE DOOR, CEILING AND WALL INSULATION
• IMPROVE GASKET OR SEALS AROUND VENTS
• IMPROVE THE HEATING SYSTEM
• IMPROVE THE MAIN FANS (OPERATION, MAINTENANCE, CONTROLS, VFD)
• USE A HEAT RECOVERY SYSTEM

Cooper, Methods of reducing the consumption of energy on wood drying kilns, 2003
POWER VENTING

- Utilizes powered intake and exhaust
- Replaces or assists existing vents
- Each vent has double the venting capacity
- For use in new or existing kilns
- Insulated vent lid with gaskets reduces heat loss and condensation
- Inside vent lids protect motors from internal moisture conditions
HOW HEAT RECOVERY VENTING WORKS

• WARM MOIST AIR IS REMOVED FROM KILN
• FRESH AIR FROM THE OUTSIDE IS PREHEATED AND RETURNED TO KILN
• HRV SYSTEMS RECOVER A PORTION OF THE LOST HEAT DURING THE DRYING PROCESS
• WATER CONDENSES AND FLOWS OUT THROUGH A DRAIN
HOW HEAT RECOVERY VENTING WORKS
HOW HEAT RECOVERY VENTING WORKS
HOW HEAT RECOVERY VENTING HELPS

- Heat loss calls for additional heating to take place after venting.
- HRV systems transfer a large portion of energy from the vented air to the incoming air.
- Heat exchangers help recover heat lost from venting by utilizing an air to air exchanger cone which provides up to 70% recovery of wasted heat.
SHOULD I USE A HRV SYSTEM WITH MY EXISTING KILN

- Have you attempted to make your kiln more energy efficient already?
- Do you have condensation building up on the inside of your kiln?
- Do you have visible heat loss?
- Does your boiler have adequate capacity?
- Are your fans reversing and using a VFD?
- Are you stacking your wood correctly and baffling?
HOW DOES A HEAT RECOVERY SYSTEM BENEFIT THE DRYING PROCESS

- Creates more of a “closed system” style environment during the drying process
- The kiln chamber has a smaller range of condition fluctuation
- Reports from customers of seeing better color in hardwood drying
- Reports from customers of seeing improved drying times
MENTION OF HEAT RECOVERY VENTING IN KILNS

- MENTIONED IN DRY KILN OPERATOR’S MANUAL, CHAPTER 11, PAGE 251
- FUEL COSTS LOW, DOES IT STILL MAKE SENSE?

Heat Recovery From Vent Air

The use of air-to-air heat exchangers—sometimes called economizers—for partial recovery of energy exhausted from dry kilns has been considered ‘for decades. Cost, efficiency, and design problems made practical application of these units marginal. Rising fuel and boiler costs, along with new designs, again make such recovery systems worth considering. In addition to conventional air-to-air heat exchangers, “heat pipes” (Perry and Chilton 1973) have recently been incorporated into a new design for dry kilns with interesting possibilities.
HEAT RECOVERY VENTING & MANUFACTURERS

- NYLE, SII DRY KILNS & OTHERS CURRENTLY HAVE INSTALLATIONS USING DIFFERENT CONFIGURATIONS OF HRV SYSTEMS
- COLLECTING DATA FOR USE IN QUALIFYING PROJECTS FOR HRV USAGE
- SUPPORTING KILN OPERATIONS TO IMPROVE EFFICIENCY
QUESTIONS