



GEO THERMAL ENERGY FOR GREENHOUSE S

Jacky Friedman

IFA Nurseries, Inc

IFA NURSERIES, INC

- Growing forestry seedlings for reforestation
- 5 nurseries throughout Oregon & Washington
- Producing up to 35 million seedlings per year, of which 5 million are produced in Klamath Falls
- Private forestry companies



WHY KLAMATH FALLS?

- East of the Cascades - new client base for IFA
- Sunshine – solar gain, natural conditioning
- Geothermal Energy
- Property tax abatement
- Price of Land



WHY DO WE NEED HEAT?

- Growing a seedling in 9 months
- Sowing & germination in Jan thru Mar
- GH temperatures of 60-75 degrees F

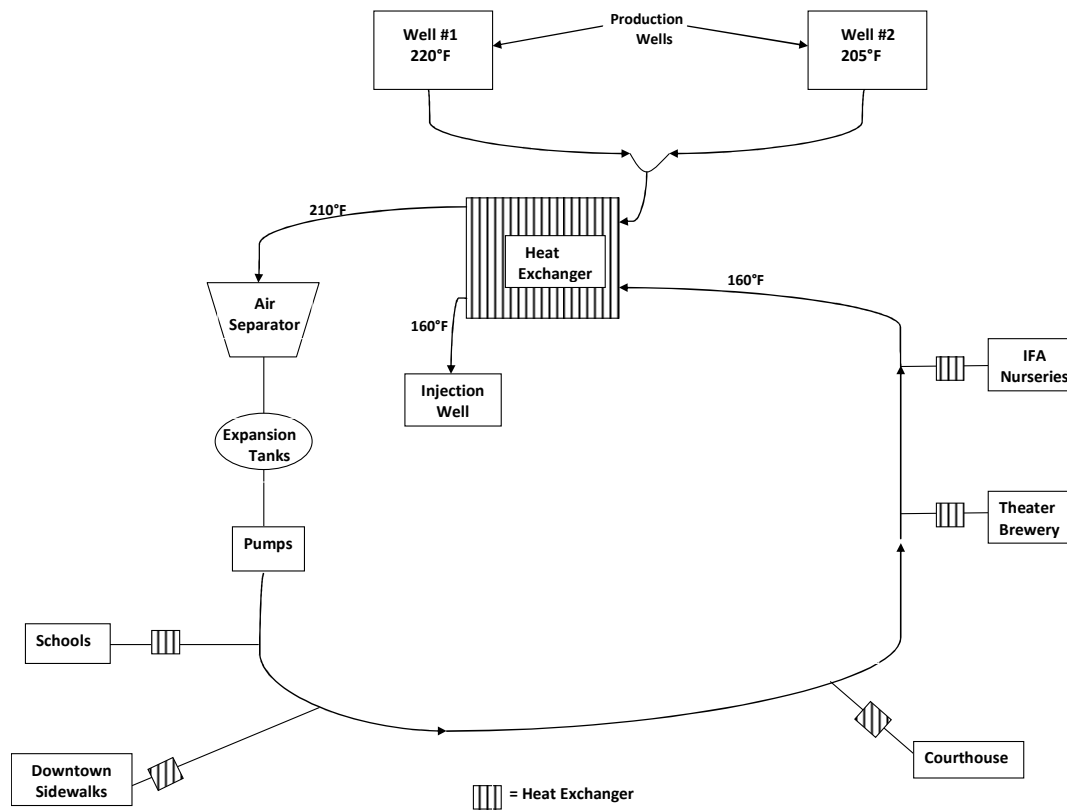


DISTRICT HEATING SYSTEM

- In 1981, the district heating system was constructed to provide geothermal resource to downtown Klamath Falls.
- The district heating system was originally designed for a thermal capacity of 20 million Btu/hr.
- In 1992, the city of Klamath Falls began a marketing effort to attract more customers to the system



DISTRICT HEATING SYSTEM



AERIAL PHOTO OF NURSERY



Waste water treatment

Geothermal

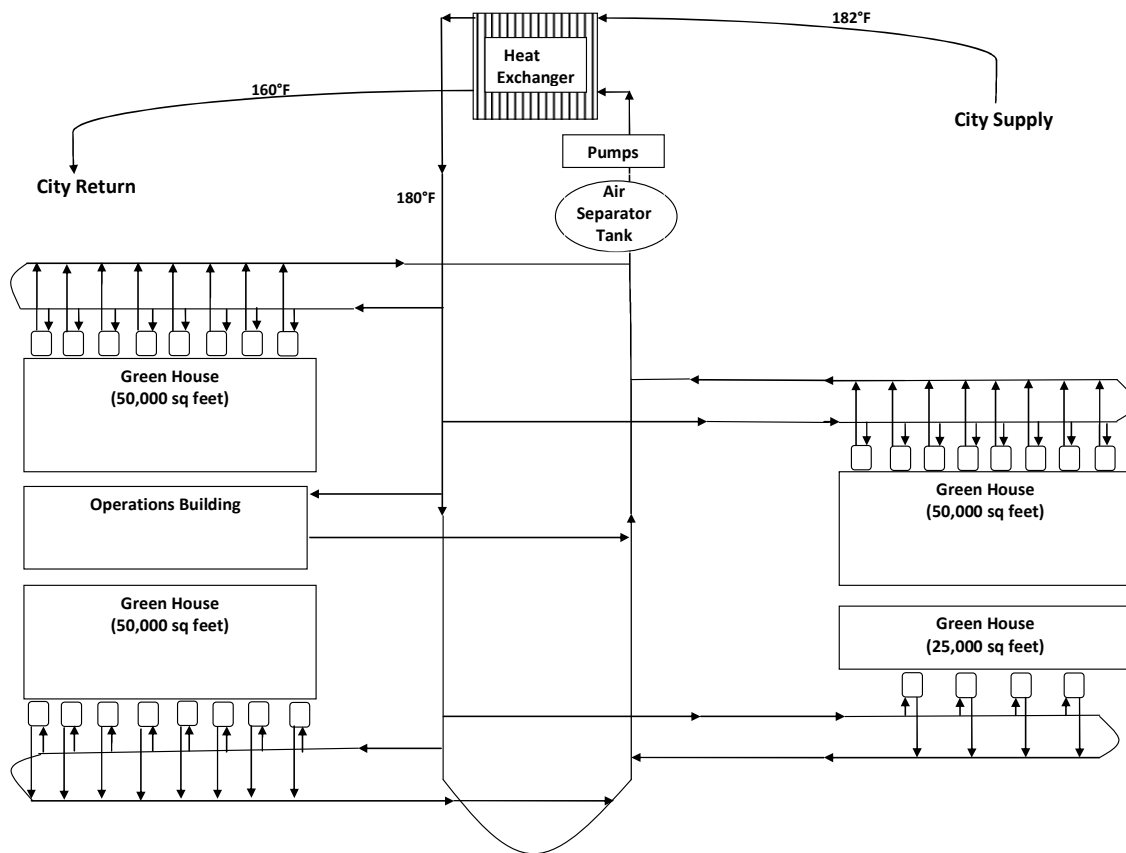
Heat exchanger



50,000 SQ.FT GREENHOUSE



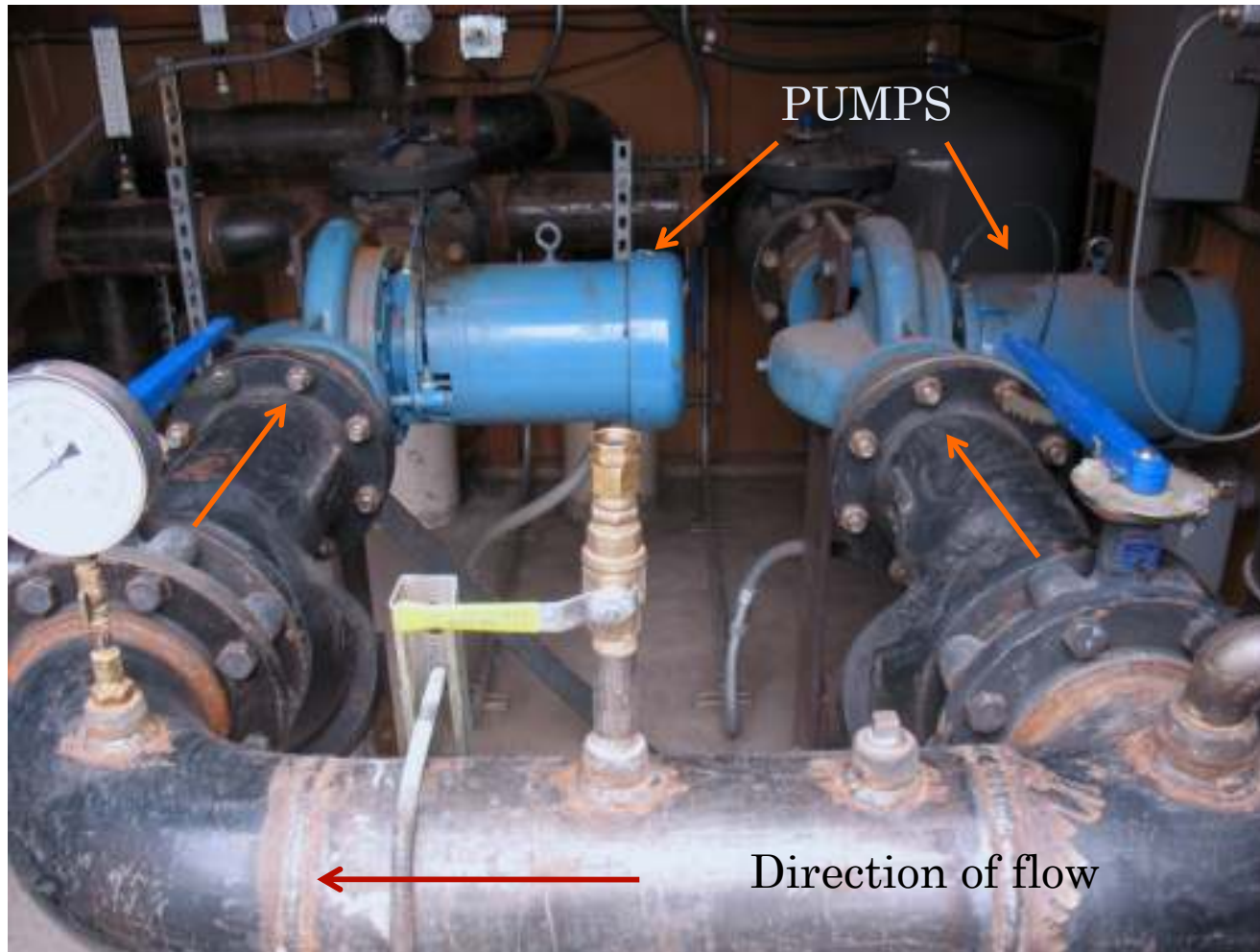
IFA NURSERIES, INC – GEO LOOP



INSIDE THE “GEO SHED”



PUMPS, VALVES & PIPES



IFA'S HEAT EXCHANGER



PLATES



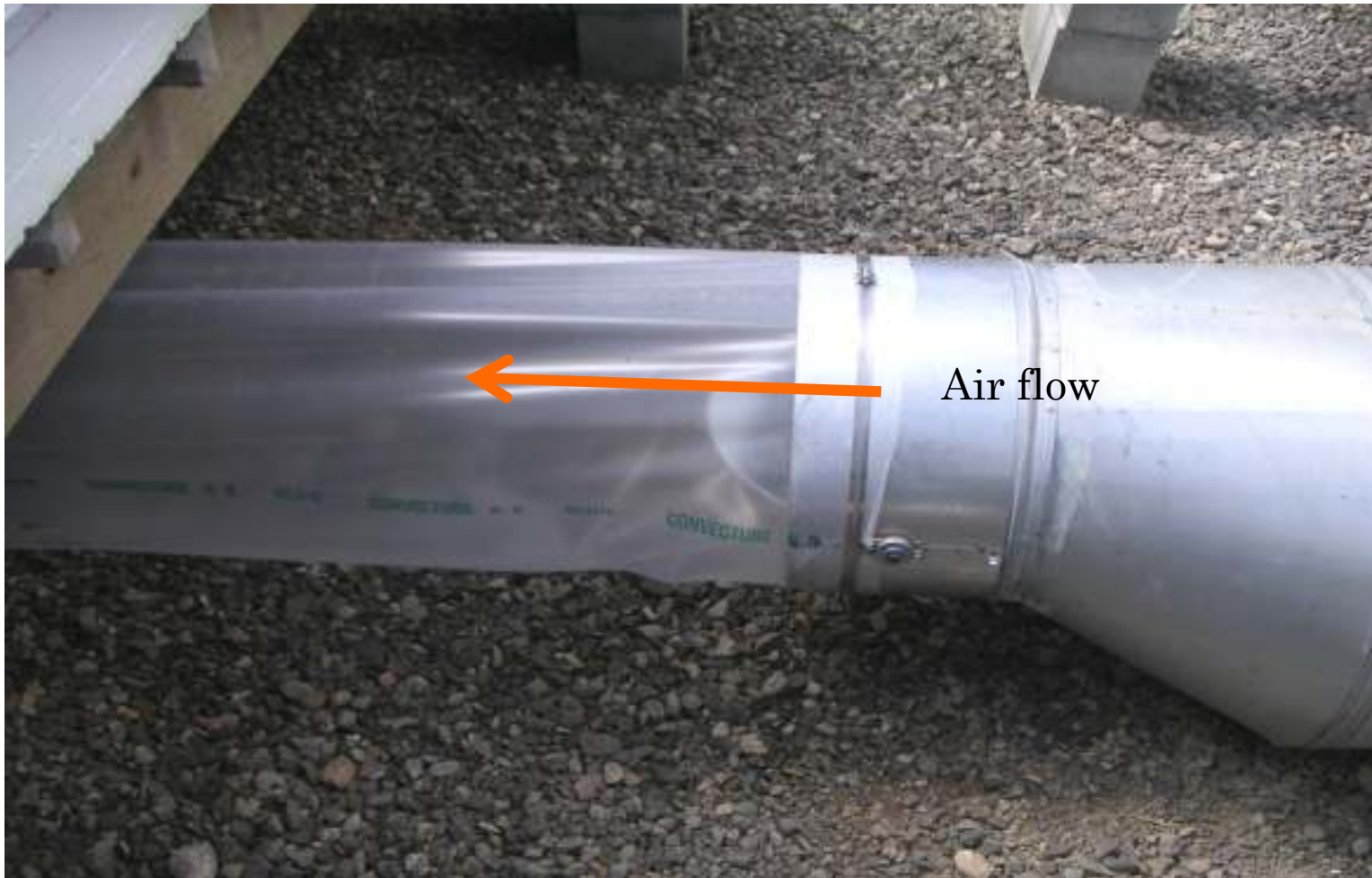
LAYING THE PIPES



UNIT HEATER & DUCTING



CONVECTION TUBING



FILLING THE CONTAINERS



SOWING – PRECISION SEEDER



READY FOR THE GREENHOUSE



IRRIGATION



GERMINATION



UNDER BENCH CONVECTION TUBE



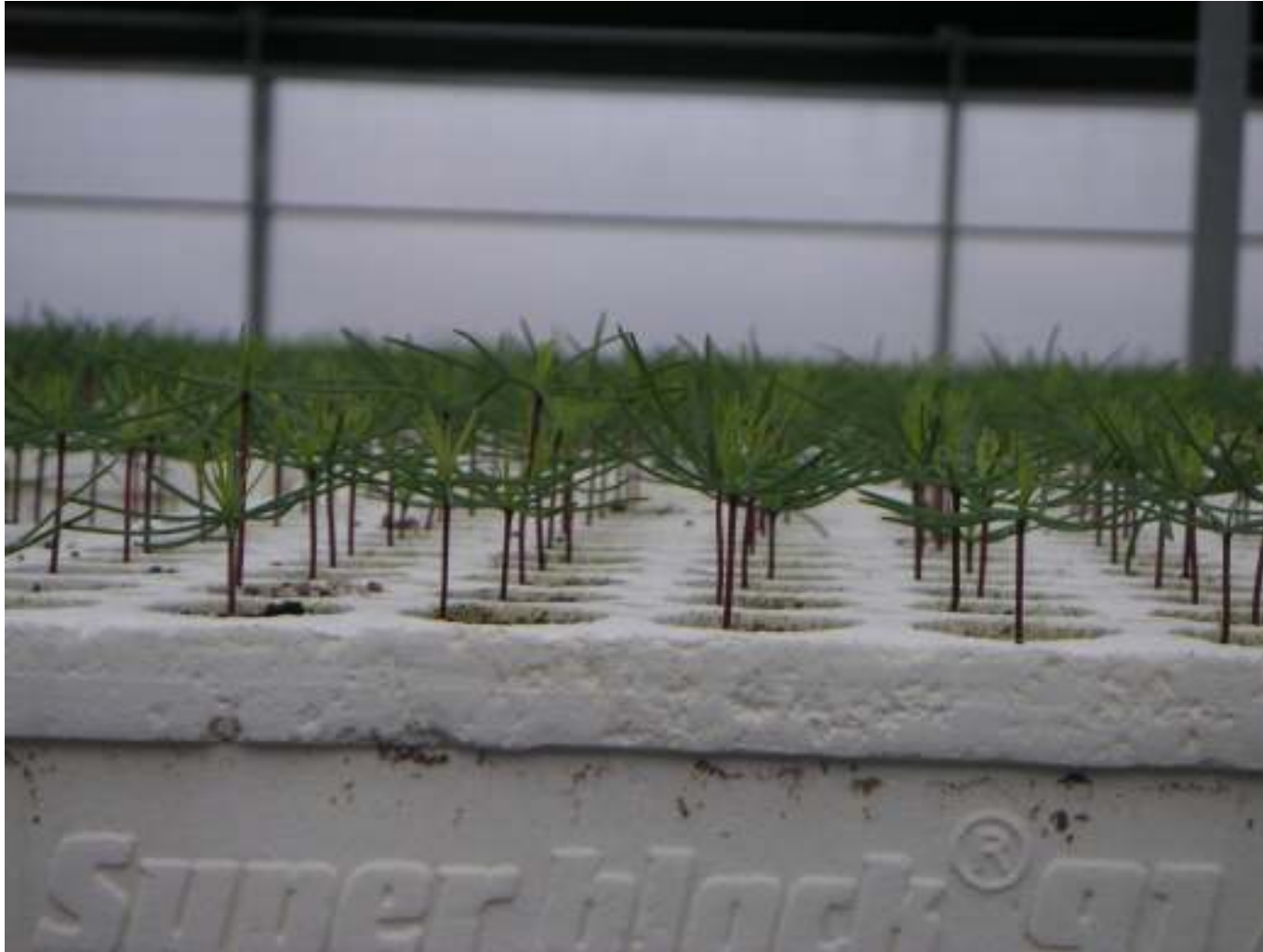
GERMINATION – DOUGLAS FIR



GERMINATION – PONDEROSA PINE



GERMINATION – WHITE FIR



THINNING – RED FIR



ESTABLISHED PONDEROSA PINE



EXTRACTION LINE



PIN-EXTRACTOR



GRADING & SORTING



SORTED SEEDLINGS



WRAPPING A BUNDLE OF SEEDLINGS



BOXING THE FINAL PRODUCT



PONDEROSA PINE PRIOR TO EXTRACTION



“SNOW TUBES”



“SNOW TUBES”



“SNOW TUBES”



SNOW!



ECONOMICS

- Charged per Therm (100,000 Btu's)
- City metered geothermal rate is set at 80% of the current commercial natural gas rate, with rate increases of no more than 10% per year.
- Current average rate is \$1.00 per Therm
- Many businesses have a fixed rate agreed in a contract with the City of Klamath Falls.
- IFA Nurseries, Inc used 98,540 Therms over the winter period (2007-8)



OUT-PLANTED PONDEROSA PINE



OUT-PLANTED PONDEROSA PINE



PLANTING SITE – YR 6





PLANTING SITE – YR 10



DISADVANTAGES

- Start up costs are high – heat exchanger, pumps, pipe, unit heaters etc
- Maintenance of equipment – heat exchanger plates every 3 yrs
- Expertise required – engineering
- Higher risk of earthquake?



ADVANTAGES

- Lower price than natural gas
- If you have it use it!
- Lots & lots of heat
- Environmental

