WESTERN UNIVERSITY'S DEEP ENERGY RETROFIT OF THE CHILLER PLANT SOUTH

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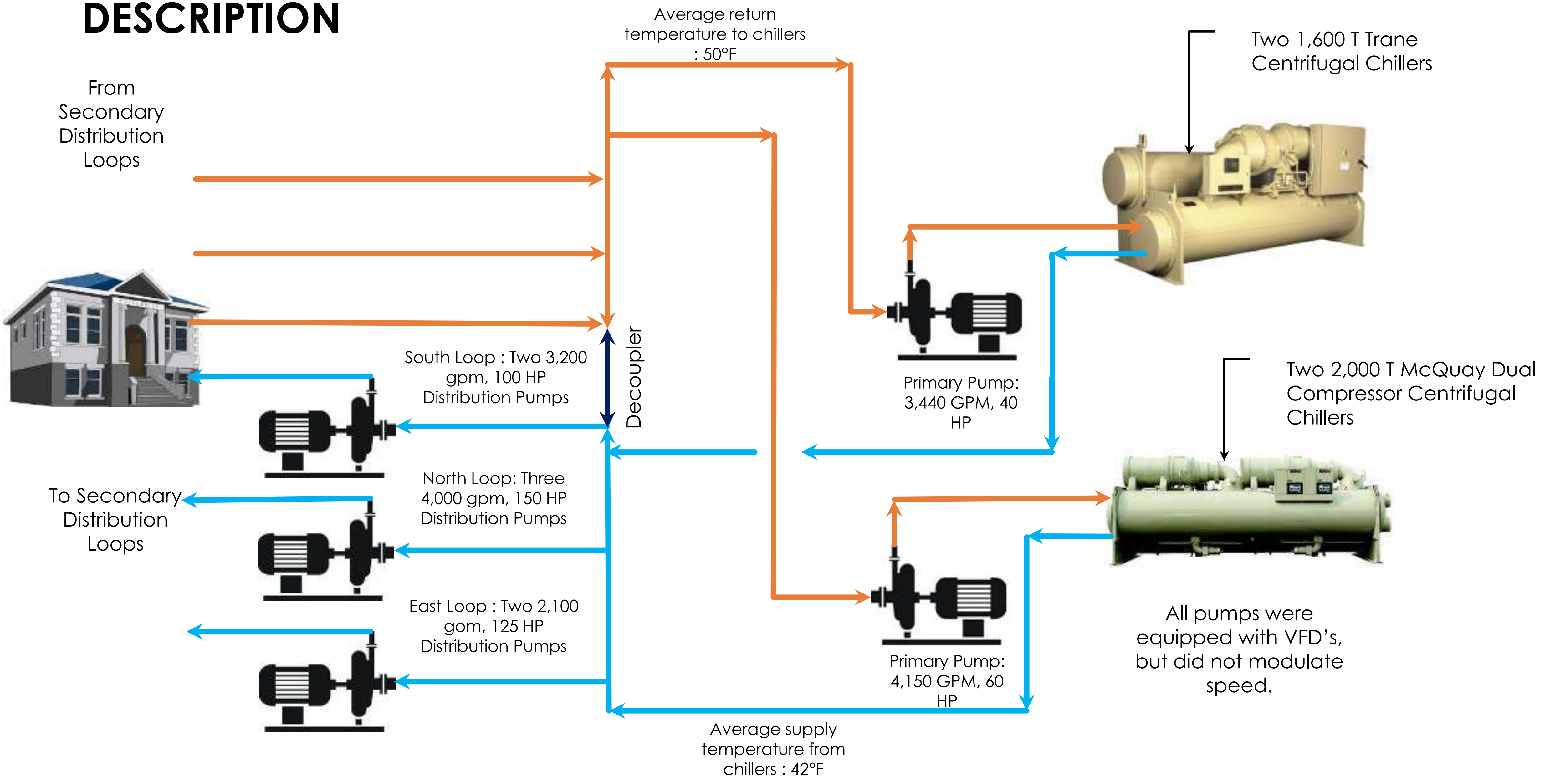
WESTERN UNIVERSITY

- Located in London Ontario
  - 100 buildings with 10.5 M square feet
  - 40,000 students, staff and faculty
- South Chiller Plant
  - 4 chillers : 2 Trane 1,600 Tons; 2 McQuay 2,000 Tons
  - 7,200 tons cooling capacity
  - Supplies 5 M sq feet of space with cooling capacity
- Electricity usage
  - 9,000,000 kWh during operating season, peak demand of 6,500 kW.
  - Before project yearly energy costs: $3,750,000

CHILLED WATER PLANT DESCRIPTION



PREVIOUS ISSUES

- Because of the decoupler, more chillers than what the campus load required had to be operating : primary pumping flow had to be higher than secondary flow to avoid return water bypassing in the district supply. This created a false assumption that the plant was at full capacity.
- Primary flow bypass in chiller return decreased entering temperature, thus decreasing chiller efficiency.

DEEP ENERGY RETROFIT MEASURES

- Modification of pumping strategy to reduce amounts of pumps in operation and allow variable flow through chillers;
- Modification of chilled water primary/secondary loops decoupler to eliminate secondary flow return water bypassing in supply.
- Modification of control sequences to allow variable pumping on primary and secondary chilled water loops.
- Modification of control sequences to allow variable pumping in condensers and modulate cooling tower fan speed according to chiller load.
- Piping modifications to reduce pressure drop in central plant: removal or opening of balancing valves on pumps.
- Cooling tower modifications to increase air flow: easing air intake to increase air flow (no fan modifications).
- Campus chilled water supply temperature reseat based on outdoor air wet bulb temperature.
- Implementation of an automatic peak demand reduction control sequence.

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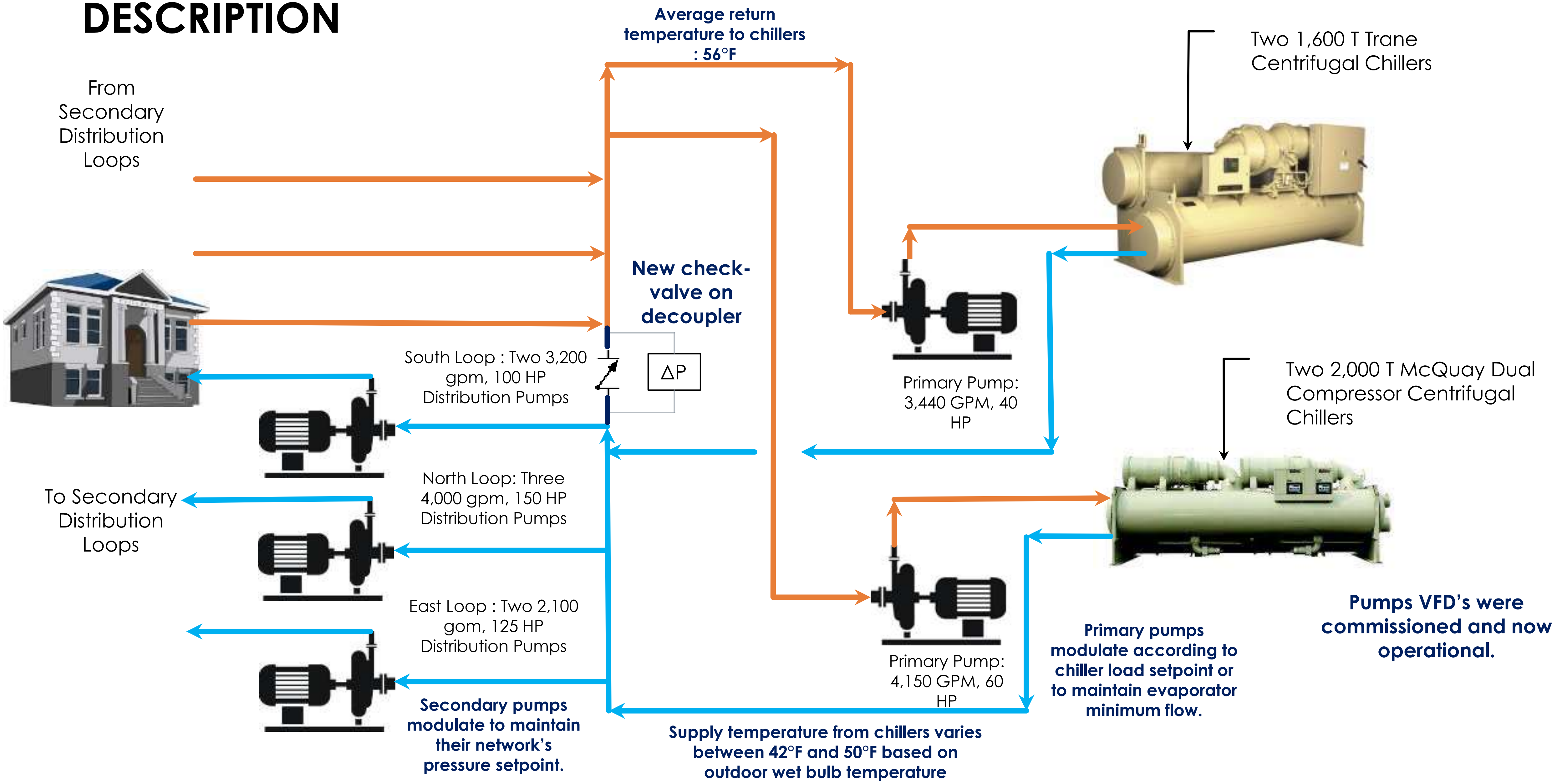

CHALLENGES

- Operators were skeptical in the beginning of success of chilled water flow variations in evaporators.

  → This was overcome with many training sessions with the entire plant's operating staff.

- The entire control sequences of the plant was redone, including automatic starts and stops of chillers and pumps.

  → Many control work sessions were done directly with the programmer and operators to make sure the control sequences were optimized and operable.

PROJECT RESULTS

- Elimination of chilled water return into the distribution loops supply.
- The plant now has an extra 1,000 tons for future buildings supply.
- Increase of chilled water return temperature, improving chiller efficiency.
- Substantial pumping energy savings with VFD operation.
- Substantial chiller energy consumption reduction with starting sequences that follows load demand.
- Operating improvement with automation of chillers starts/stops and peak demand reduction sequences.
- Reductions of 3,000,000 kWh and 1,000 kW in peak demand.
- Yearly costs savings of $630,000.

CONCLUSION

- This project was a success on the energy reduction level as well as on the operational level.
- Skepticism was overcome with training and demonstration.
- Variable flow through existing chillers is possible.
- Primary/secondary loops decoupler has to be unidirectional to maintain chiller minimum evaporator flow.