INVESTIGATION AND OPTIMISATION OF COMMERCIAL REFRIGERATION CYCLES USING THE NATURAL REFRIGERANT CO_2

A thesis submitted for the degree of Doctor of Engineering

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APPENDIX A

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Appendix A

This section includes further details on the technical specification of the experimental equipment used to monitor the CO_2 system

1. Pressure and Temperature Sensors

The pressure sensors used for the experimental system were Danfoss pressure transducers, Model: MBS33. The specification is shown in Appendix A – 1 – Pressure sensor spec .

The temperature sensors used for the experimental system were type T thermocouples. The specification for this type of thermocouple is shown in Appendix A – 2 – Thermocouple spec. The thermocouples were attached applied to the refrigeration pipe using several layers of aluminium tape to secure the contact when the temperature is high. The tape was then covered with several layers of insulated armaflex tape to keep the contact secure and to protect the thermocouple from the influence of the external environment.

Both the pressure sensors and the temperature sensors were connected to Datascan 7020 data acquisition modules. The specification of the Datascan 7020 module is shown in Appendix A – 3 – Datascan module spec.

2. Software

The software used for recording and real-time viewing of the data from the CO_2 refrigeration system was Labtech. Microsoft Excel was used to analyse the results of the experimental system

3. Compressors

The compressors used for the experimental system were 2 x Bock RKX 26/31-2 used for the high pressure side of the Booster system and 1 x Bock HGX 12P/30-4 used as the low pressure Booster compressor. The specifications for the compressors are shown in Appendix A – 4 – Bock RKX 26/31-2 and Appendix A – 5 – Bock HGX 12P/30-4

4. Valves

High pressure valve – ICMT – Appendix A – 5 – ICMT

Gas bypass valve – ICM - Appendix A – 6 – ICM

Evaporator Electronic expansion valves – Appendix A – 7 - AKVH

5. Controls

System master controller – Appendix A – 8 – Danfoss AKSC255

ICMT Valve Controller - Appendix A – 9 – Danfoss EKC326

ICM Valve Controller - Appendix A – 10– Danfoss EKC347

Expansion valve controllers – Appendix A – 11 – AKCC550A