CHAPTER ONE

1.0 INTRODUCTION

1.1 Background of the Project

Air conditioning systems are indispensable for thermal comfort and operational efficiency in various environments, especially in regions with significant temperature variations (Jones, 2018). Split air conditioning systems are globally adopted due to their installation flexibility and efficiency (Brown et al., 2021). The demand for comfortable indoor climates continues to drive the proliferation of these systems (Smith & Lee, 2020).

However, widespread air conditioning use presents challenges. Air conditioning systems are substantial energy consumers, significantly contributing to global electricity demand and greenhouse gas emissions (Pérez-Lombard et al., 2011). The operational lifespan of these systems is often shortened by inadequate maintenance, component degradation, and refrigerant leaks, leading to performance decline and system failure (Chan, 2015). Disposa'.