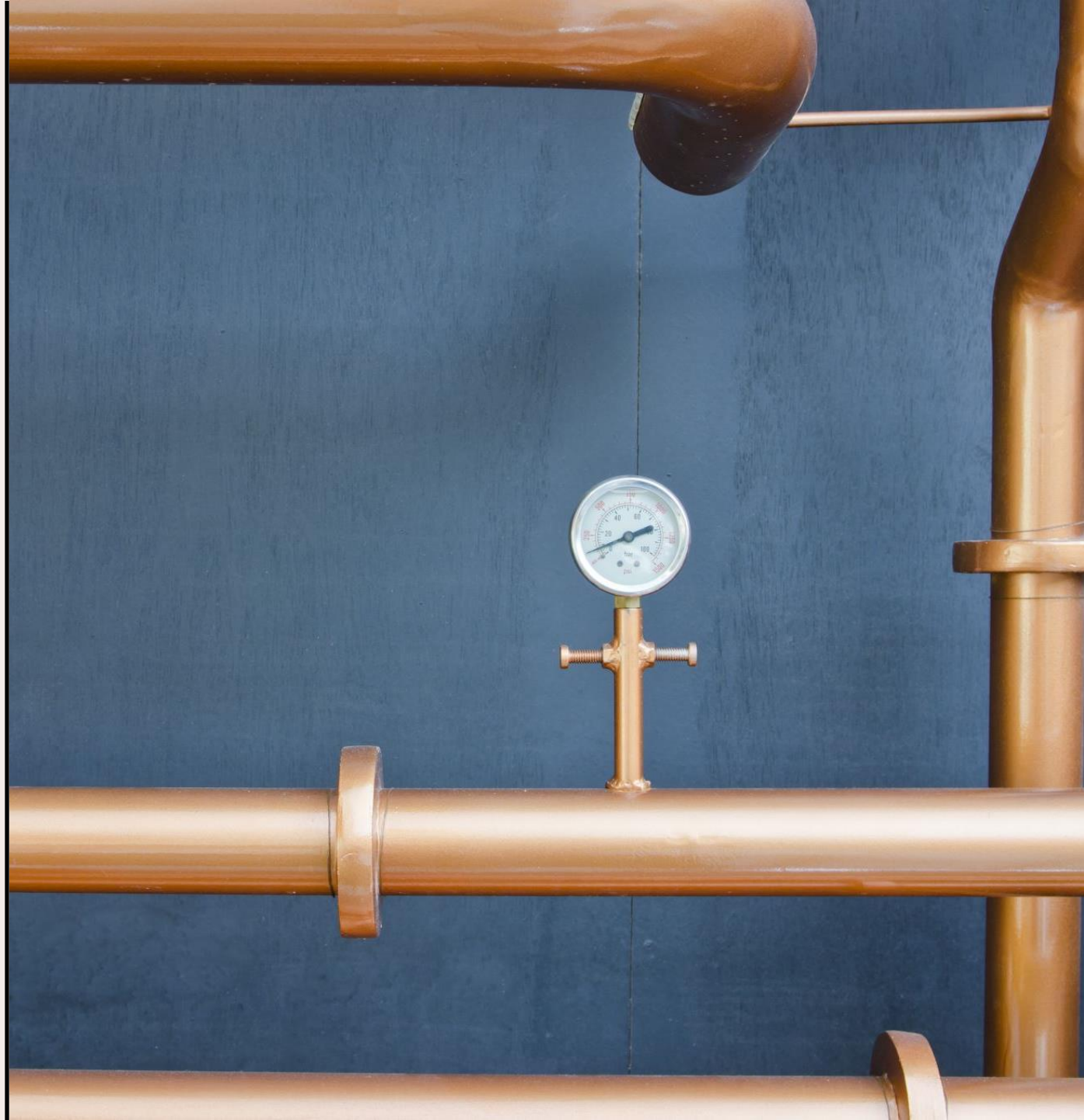


Compressed Air Optimization Case Study

IMPROVING EFFICIENCY AND REDUCING COSTS
IN AIR SYSTEMS



Introduction

Compressed Air Optimization Overview

Facility Overview and Energy Use

The automotive parts facility uses compressed air for 38% of its electricity consumption, highlighting energy savings potential.

Energy Reduction Results

The optimization program reduced compressed air energy usage by 34%, saving £38,400 annually and cutting CO₂ emissions by 142 tonnes.

Optimization Approach

A four-phase strategy included monitoring, leak detection, pressure optimization, and automation to improve efficiency.



Client Profile and Challenges

Facility Overview and System Inefficiencies

Excessive Pressure Operation

The system operated at 8.5 bar pressure while equipment only required 6.5 bar, causing energy waste.

Significant Air Leakage

Air leakage was estimated at 35–40% of compressed air production, reducing system efficiency.

Inefficient Compressor Control

Multiple compressors running at partial load simultaneously led to inefficient energy usage and wear.

Lack of Monitoring and Demand Control

Absence of real-time monitoring and uncontrolled demand increased energy consumption and operational costs.



Energy Baseline Analysis

Pre-Optimization Performance Metrics

High Air Consumption

The system's air consumption averaged 842 m³/hr, exceeding the expected 500–600 m³/hr benchmark.

Excessive Power Usage

Specific power usage was 0.168 kW per cfm, surpassing the industry benchmark range of 0.11–0.13 kW per cfm.

High Electricity Costs

Annual electricity costs reached £112,800, significantly above the benchmark of £65,000–£75,000.

Low System Efficiency and High Leak Rate

System efficiency was 58%, below the target 75–85%, with estimated leak rates between 295–335 m³/hr.



Optimization Strategy

Four-Phase Implementation Plan

Phase 1: Monitoring Setup

Installed wireless energy monitors and sensors for real-time compressed air system data monitoring in the cloud.

Phase 2: Leak Detection and Repair

Detected and repaired 87% of leaks, recovering significant compressed air volume and improving efficiency.

Phase 3: Pressure Optimization

Reduced system pressure and installed point-of-use regulators to optimize compressed air usage.

Phase 4: Automation Improvements

Implemented automated controls for compressor sequencing and shutdown, eliminating inefficient air use.



Results and Financial Impact

Energy Savings and Investment Analysis

Energy Savings Breakdown

Leak repairs accounted for 41% of savings, with other measures contributing significant energy reductions.

Cost Savings and Investment

Total annual cost savings reached £38,400 against an investment of £31,400, showing strong financial benefits.

Payback and NPV

The simple payback period was 8.2 months with a 10-year NPV of £265,100 at a 5% discount rate.



Environmental and Operational Benefits

Sustainability and Monitoring Enhancements

Energy Reduction Impact

Optimizing compressed air reduced energy use by 384,000 kWh annually, cutting CO₂ emissions by 142 tonnes.

Real-Time Monitoring System

The Energy Portal offers real-time alerts, weekly trend reports, predictive maintenance, and leak audits.

Continuous Improvement Tools

Energy KPI dashboards track power consumption versus production to support ongoing efficiency improvements.

Sustainability and Automation

Integration of monitoring and automation ensures long-term energy efficiency and supports carbon reduction goals.



Conclusion

Lessons Learned and Future Outlook

Data-Driven Optimization

Real-time monitoring enabled precise measurement and verification for effective compressed air system optimization.

Quick Wins and Savings

Leak repairs provided immediate energy savings and built momentum for continuous improvements.

Staff Engagement and Training

Training staff on best practices helped eliminate inappropriate uses and fostered a culture of efficiency.

Sustained Energy Savings

Continuous monitoring ensured long-term maintenance of energy savings and supported sustainability goals.

