Group Project

***Automated Garage Door System***

Course Number: ROB8201 Section 410

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# **Introduction**

In this project, our group looked into making an industrial garage door opener powered by pneumatic controls. The system could be used in many areas such as loading docks, warehouses, airplane hangars, etc. The reason behind our interest in using pneumatic controls is that an industrial building often already contains a compressed air supply, meaning that little extra resources would be required to add to the building (other than the parts for the door itself). The entire system is pneumatically controlled and powered, allowing the whole process to be completed without electricity; averting electricity might be a factor in a setting such as a loading dock where isolation of water might be difficult to avoid.

# **Materials**

Four (4) 3/2 normally closed valves (button)

Four (4) shuttle values

Two (2) 3/2 normally closed valves (proximity)

Two (2) double acting cylinders

Two (2) flow control valves

One (1) 5/2 double pilot valve

# **Procedure**

In the initial position of the circuit, both cylinders A1A and 1A2 are fully extended (the closed setting of the door). These cylinders both have flow control valves on them to make sure they extend and retract at a safe speed. To open the door, pressure must be supplied to the right side of 1V3; this can happen in two scenarios: if 1V8 or 1V9 is actuated, and if 1V6 or 1V7 are pressed (acting as proximity sensors). The reason for having both these controls is that both 1V6 and 1V7 are “safety” features of the system; situationally this means that if either detects pressure on them, the door will retract to avoid crushing or harming a person/object. When either 1V4 or 1V5 is actuated, it will extend the cylinders (thus closing the door).

In this system we used shuttle valves (1G1, 1G2, 1G3 and 1G4) quite often, to provide more options to the user. For example, there are two buttons for both closing and opening the door. The rationale behind this is the user will probably need to access the opening/closing functions from both sides of the door.

# **Results**

This project was successful as we were able to meet all the requirements of the system. It would have been interesting to integrate a pneumatic timer into the system. While we did not encounter any limits in the logical sense of the system, we encountered some difficulty when setting the system up in the lab. For example, we were unable to mount the cylinders vertically with the sensors. Also, it was hard to simulate the sensors as we could not build the real would system.

# **Conclusion**

In this final project, we learned how to integrate several pneumatic controls into one useful circuit to perform a task. This circuit transcends into a real world application, which is the goal of this course. Overall, the project was a successful learning expereince.

# Schematics

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| --- | --- |
| *Evaluation Guide for ROB8201 Group Project* | Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **5** | **4** | **3** | **2** | **1** |
| ***Introduction*** | | | | | |
| • successfully establishes the context (industrial process) of the project |  |  |  |  |  |
| • presents interesting questions or issues related to the project |  |  |  |  |  |
| ***Materials*** | | | | | |
| • accurately lists the parts used in the project |  |  |  |  |  |
| ***Procedure*** | | | | | |
| • gives enough details to allow for replication of project |  |  |  |  |  |
| • include full schematics and diagrams of circuits involved |  |  |  |  |  |
| ***Results*** | | | | | |
| • opens with an explanation of how the lab project related to the industrial process |  |  |  |  |  |
| • addresses limits, difficulties and solutions found during the project |  |  |  |  |  |
| ***Conclusion*** | | | | | |
| • convincingly describes what has been learned by doing the lab |  |  |  |  |  |
| ***Written presentation*** | | | | | |
| • format of tables and figures, citations and references is correct |  |  |  |  |  |
| • report is written in scientific style: clear and to the point |  |  |  |  |  |
| • grammar and spelling are correct |  |  |  |  |  |
| ***Oral presentation of Project*** | | | | | |
| • circuit is described; all members take part in describing project |  |  |  |  |  |
| ***Overall Aims of the Report:*** *The student...* | | | | | |
| • has successfully learned what the project is designed to teach |  |  |  |  |  |
| • has dealt with difficulties and solved problems |  |  |  |  |  |
| ***Finally*** |  |  | | | |
| • project demonstrated properly (project works) (5 marks or 0 marks) |  |  | | | |
|  | | | | | |

**Total Mark = /80**