# Quality attributes

## Design Qualities

Conceptual integrity

The developed system is able to show a digital model of the physical gauging station in real time as operations take place on it. The digital model is essential a CAD model of the system that is able to simulate real world physics of the system and can communicate with the Siemens s7 1200 model through it memory/merkel tags.

The can therefore be monitored in real time from a PC. Main merit of this setup is easy maintenance.

Maintainability

The physical system can be easily maintained owing to the provision of a CAD model that can be simulated. Optimization of the system can be done by altering the mechanical parameters of the CAD model and developing a PLC program that can drive the CAD model without physical connections. This enhances overall productivity of maintenance of the system.

Furthermore, the system allows for predictive maintenance which is always a big plus for any machine due to the vast efficiency it brings to the machine operation.

Reusability

Since all the control is base on a Programmable Logic Controller(PLC), all the advantages of it are available for this system. The modularity that comes with the PLC plays a big role in re-using of the system for other applications. For instance, an executable program for another machine may be included/programmed on the same PLC without affecting the core logic of the original. In addition, on adding another CAD model, of any adjacent station to the Gauging one, the core frame structure are similar in structure and thus eliminate the need to design a new one.

## Run-time Qualities

Interoperability

Given the availability of 3rd party drivers for the PLC, data and information between the PC and the PLC is easily achievable. Industrial Ethernet is the core interface used for this project for the transfer of data and data can be obtained through a number of ways, PC Stations, OPC etc.

Manageability

With the ability to view and operate the station from its digital twin, the system can be easily managed. Given the external signal configurations offered by SIEMENS NX software, the system may even be managed and viewed from a remote location.

Reliability

With the development of good communication infrastructure and hardware/software interfaces, the system is reliable. Industrial Ethernet provides a stable form of connectivity between the PC and PLC that is reliable with sufficient data transmission rates.

Scalability

The system gives provision for scalability given the high data transmission rates offered by the Industrial Ethernet interface. Furthermore the integrating software is not limited to any number of variables that can be humanly conceivable for the purposes of bridging communication between the PLC and its digital twin counterpart.

## System qualities

Supportability

With the current developed version of the system, supportability is quite limited. With the operations in real time, support can be given in the event that the station operation comes to halt. The operator can therefore note the system inactivity on proceed to provide support.

However, supportability of the system may be improved with application of data science on the data provided by the system, which will enhance diagnosis and prognosis of the physical system.

Testability

When it comes to testability, the system has an advantage of having a digital counterpart in Siemens NX. Since the twin effectively replicates the characteristics of the physical station, testing and simulation of the system may be done on Siemens NX without having to interact with the physical station.

Security

The system is able to only allow recognized users to access it through face recognition

Simplicity

The system can be controlled by voice commands by an authorized user therefore making the system simple to operate but still secure