

ENGINEER PROFILE

Name: Carlos Garcia

Organization: San José-Santa Clara Regional Wastewater Facility

Engineering Discipline (Check one below):

- Civil
- Mechanical
- Electrical
- Environmental (including Process)
- Structural
- Information Technology
- Instrumentation & Control - SCADA
- Other



1. Please describe the work you do:

As a Senior Process and Systems Specialist (SPSS), I am charged with the maintenance, upgrade, configuration and programming of the Distributed Controls System (DCS), an industrial scale computerized system used to automatically control the various sewage-treatment processes of the Plant. I am also charged with the collection and safekeeping of the data produced by the DCS for use in the generation of Compliance and Regulations reports.

In my capacity as an SPSS, my duties are to: maintain the uninterrupted operation of the DCS; maintain and upgrade the controls' Fiber and Ethernet networks; maintain existing and develop new control algorithms to automatically control the facility's instrumentation; develop and implement C#, VB.NET, and Excel VBA solutions to collect and transfer DCS and Laboratory-specific data to an SQL database; develop, administer, and maintain the SQL database; act as the group's purchasing agent with a combined parts, repairs and upgrade budget of \$500,000; and to fully train new personnel in every aspect and task expected of a Process and Systems Specialist as defined above.

2. What combination of education, experience, and skill was required in order for you to obtain your job?

My path toward becoming a Process and Systems Specialist was not by design but rather by necessity. I graduated with a BS in Mechanical Engineering but my true passion was computer science which I discovered too late to switch majors. However, shortly after graduation, I began to develop my desktop and network support skills and took a couple of additional college courses on computer programming. After a few years of entry-level jobs, I started a game development company. Six years and three games later, game production became too expensive for a single-owner operation so I landed a job with the City of San Jose as an IT guy for the Regional Wastewater Facility (RWF). Two years after my arrival, the individual supporting the Distributed Control System (DCS) announced that he was leaving the City. By now, I had supported 400+ Personal Computers, Ethernet and fiber networks (including the DCS networks), and on occasion had helped and written some small applications for the DCS guy. With no time to find a replacement and because of my computer and hydraulics background, I was asked to step in until a replacement was found.

As years went by, the UNIX-based system was replaced by a Windows-based system and with that, Windows Server, Active Directory, and other technologies have become required knowledge for a

Process and Systems Specialist. Also, in the controls world, communication technologies go far past the computer and integrate into instruments in the field, whether these are pumps, valves, or generators, most instruments are now pre-loaded with multiple programming and communication protocols. At the same time, Human-Machine Interfaces (HMI) have become more sophisticated than ever, and creating graphical HMIs is also part of the daily routines of a Process and Systems Specialist.

In reality, the Process and Systems Specialist job crosses too many disciplines to be boxed into one specific major. Being a good engineer or programmer of any kind doesn't make a Process and Systems Specialist. But it is a good start.

And yes, the replacement found for the DCS guy was me.

3. What do you like best about your job?

I like that every single day is different and more challenging than the day before. The multi-discipline nature of my job encourages me to stay up-to-date on many technology areas and requires regularly interfacing with people so that I am never confined to become an isolated individual in a cubicle.

4. Please tell us about the water or wastewater engineering project you enjoyed working on the most, and what made it rewarding,

I enjoyed working on the Alternative Disinfection Project. This project replaced the potentially deadly Chlorine/SO₂ disinfection system in favor of the safer Hypochlorite/Sodium Bisulfite-based disinfection system.

During the course of this project I successfully coordinated multiple contractors, engineers, and trade shops' personnel. I assumed multiple roles, including lead roles, with the objective of successfully completing the project on time. Based on process and instrumentation drawings (P&IDs), I designed the input/output (I/O) landing schedules and designed two of the larger I/O panels currently in use at the Regional Wastewater Facility. I configured, debugged, and loop-tested over 800 hardwired I/O signals; successfully installed dual-redundant communication boards with dual communications protocol interfaces over fiber; helped coordinate the physical migration of a running, live distributed control unit, to a different location with zero disruption to existing processes; and created a system of independent computer sequences and graphics that control and monitor 19 chemical feed pumps, 3 transfer pumps, over 35 motorized valves, over 15 flow meters, and multiple level and pressure transmitters.

5. What qualities and capabilities are needed in order for an engineer to be successful in the water/wastewater industry?

You will need to have the technical knowledge and skills, such as:

- Knowledge of Controls theory and Controls programming concepts;
- Knowledge of industrial instrumentation operational parameters, interfaces and interactions;
- In-depth knowledge of technical aspects, including configuration, maintenance and programming of any Distributed Controls System or SCADA system;

- Knowledge of computer programming and computer networking;
- Knowledge of database systems is a plus but not required;
- Ability to work in a team environment and able to work late nights or weekends;
- Ability to troubleshoot under pressure and at odd hours; and
- Ability to keep a reliable schedule.

6. Do you have any advice for an individual who is considering pursuing a career as an engineer in the water/wastewater industry?

Visit as many Waste Water Plants as possible. Take tours whenever available and connect with people in the industry. Find out what makes them want to get up in the morning and go to work at a sewage plant and why they wouldn't trade it for the world.