



THE POWDER SHOW DIGITAL FLOW



Industry 5.0 for Food & Beverage Processing

Presented by Ben Knowles and Edel Rodriguez





Meet our Team

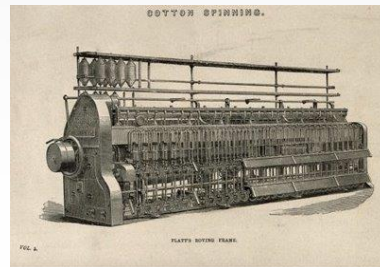
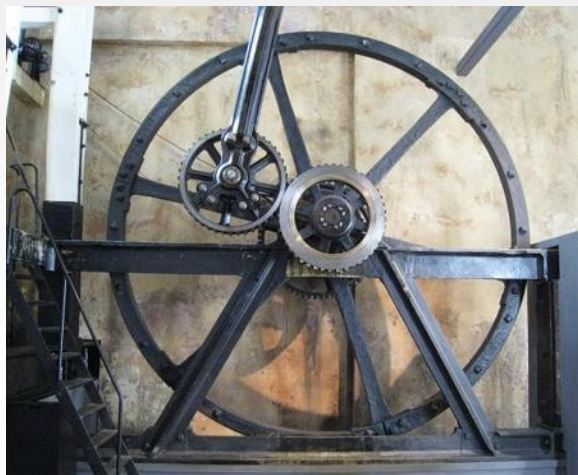


Ben Knowles
VP of Technology



Edel Rodriguez
VP of Sales

The First Industrial Revolution (1760-1840)



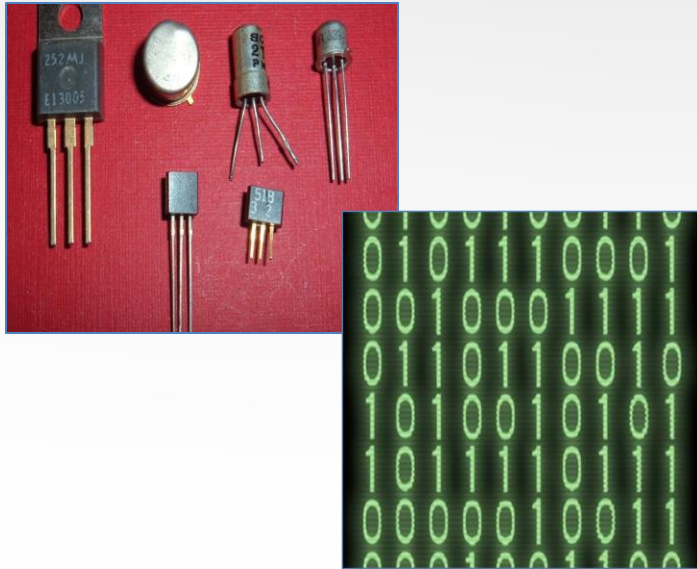
- Introduced the first widespread adoption of machine technology
- Iron production was significantly improved due to advancements which allowed bigger machines to be created for less money.
- Steam engines were refined so that they could produce more power with less fuel.
- These advancements greatly increased the productivity of the average worker.

The Second Industrial Revolution (1870-1914)



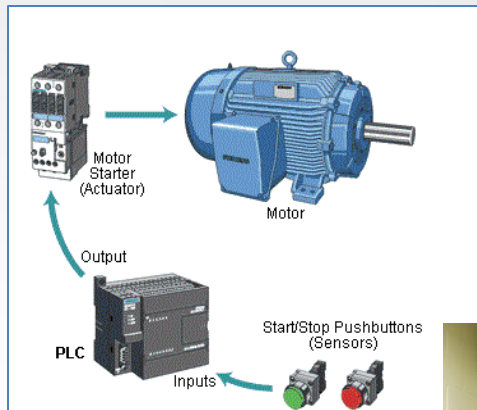
- Introduced the first adoption of widespread systems and networks of technology.
- Saw widespread use of railroad networks to transport people and goods.
- The telegraph was widely adopted, allowing companies to quickly communicate with each other on opposite sides of the country.
- Later saw the adoption of the telephone and electric power as well as widespread adoption of gas, water, and sewage systems

The Third Industrial Revolution



- Known as The Digital Revolution
- Occurred during most of the second half of the 20th Century
- Invention of transistors, the building blocks of the digital world
- Transistors allow massive amounts of data to be computed, and they led to the invention of the first digital computers in the 1940s.
- Even today, transistors serve as the foundation for electronics

PLC (Programmable Logic Controller)

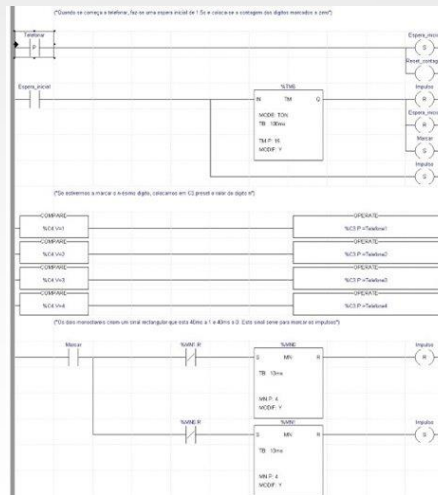


- PLC is just a simple computer designed for engineering and industrial applications
- Most industrial machines today are controlled by these PLCs.
- PLCs receive information from sensors and then send back information to the machine about what it should do in a given scenario.
- Can create an entire complicated system that can react based on any number of situations that happen within a machine.



Limitations of PLCs

```
function_exists('hex2rgb') ) {  
    $hex_str = preg_replace('/[0-9A-Fa-f]/', '', $hex_str);  
    $rgb_array = array();  
    if ( strlen($hex_str) == 6 ) {  
        $color_val = hexdec($hex_str);  
        $rgb_array['r'] = 0xFF & ($color_val >> 0x10);  
        $rgb_array['g'] = 0xFF & ($color_val >> 0x08);  
        $rgb_array['b'] = 0xFF & ($color_val >> 0x00);  
    } elseif ( strlen($hex_str) == 3 ) {  
        $rgb_array['r'] = hexdec(str_repeat(substr($hex_str, 0, 1), 2));  
        $rgb_array['g'] = hexdec(str_repeat(substr($hex_str, 1, 1), 2));  
        $rgb_array['b'] = hexdec(str_repeat(substr($hex_str, 2, 1), 2));  
    } else {  
        return false;  
    }  
    return $return_string ? implode($separator, $rgb_array) : $rgb_array;  
}  
function_exists('hex2rgb') ) {  
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}
```

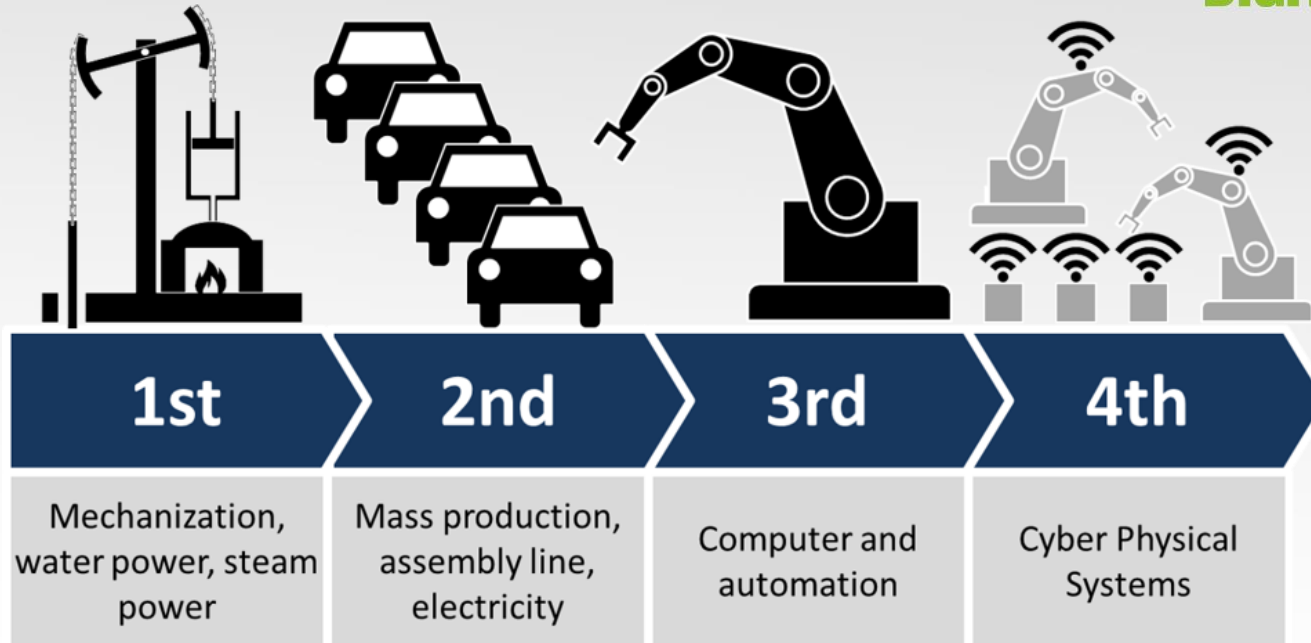


- PLC exist in a bubble
- They utilize "ladder logic" which is a totally different paradigm from normal software
- It's also a closed loop system, meaning data does exist within the PLC and its devices, but not accessible to the outside world

The Fourth Industrial Revolution



- Industry 4.0, also known as The Fourth Industrial Revolution, creates new questions about how to adapt PLC technology to modern manufacturing.
- Introduces "Cyber Physical Systems"
- In other words, where software and the Internet meets industrial systems like PLCs (comprising the "Internet of things").
- Can be controversial because this often eliminates jobs, it also leads to greater efficiency, increased performance, and reduced waste.



The Internet of Things



- Describing the giant network of different things that interact with other things using the internet.
- Cameras, sensors, speakers, and any other “thing” that’s built to send out and/or allows people to interact with each other using devices
- The industrial internet of things: ability for different systems to interact with each other and send and receive data using the internet



Latency and Bandwidth

- Internet latency has natural physical limits
- Bandwidth can get clogged like traffic



Interoperability



- In order for Industry 4.0 / IIoT to work, you need to have the ability to communicate between systems and a way for software to bridge the gap to the PLC side.
- There have been more open standards in the industrial landscape, like EtherNet/IP, CIP, OPC UA.
- Issues can arise with companies not implementing parts of the standard, or not documenting the proprietary things they've added in order to perpetuate their vendor lock-in.
- It's important to work with a solution provider that understands the landscape and can help build systems that either take advantage of these technologies from the get-go, or allow for a clean path to add IIoT functionality down the road.

Security

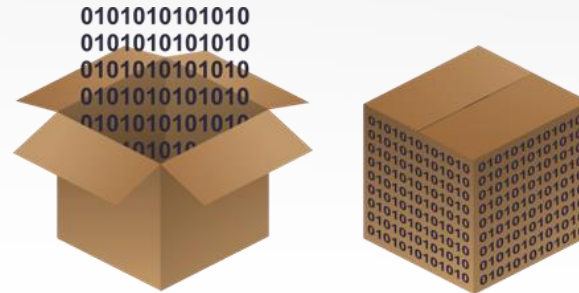


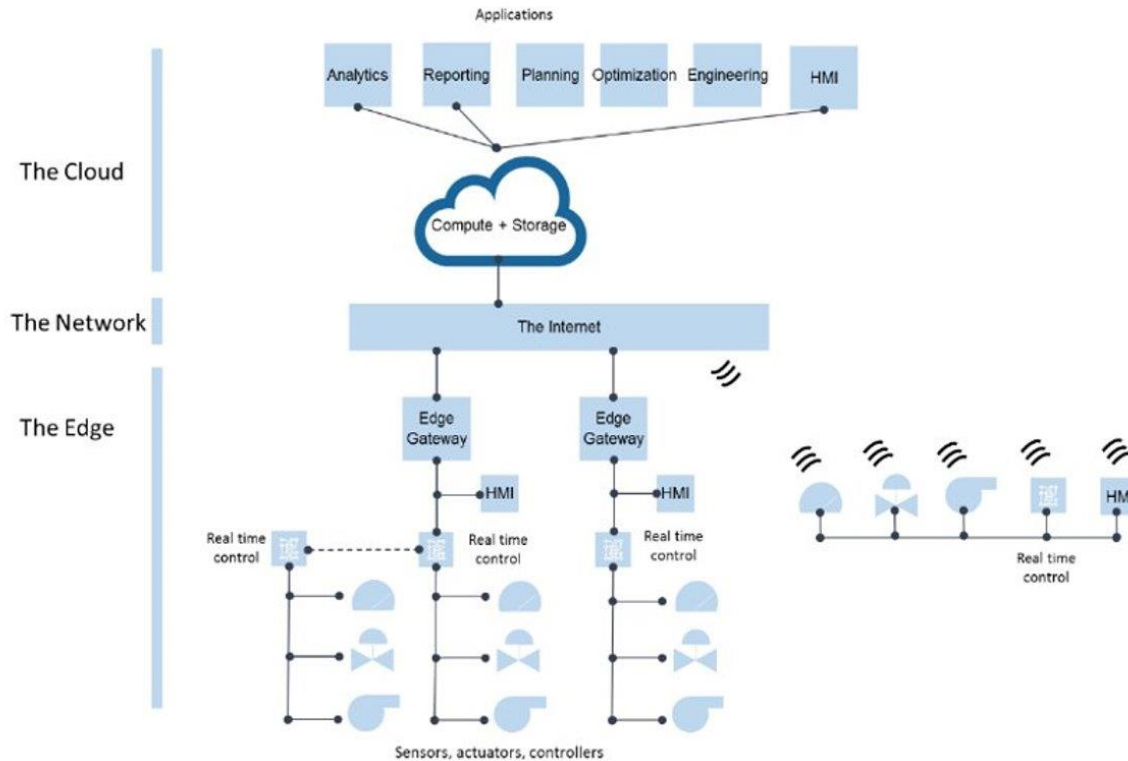
- A lot of nuclear power plants have been sticking to analog systems
- Security in IIoT hasn't been fully figured out.
- Industrial machines can run 24/7 for many years, but IT systems have a much shorter replacement cycle on the order of 5 years and sometimes less.
- Someone needs to support these IT systems, keeping them updated and secured.

Edge Computing



- Means taking a ruggedized server and putting it on a factory or industrial floor close to the equipment that's sending out data.
- Moves the data processing closer to the actual data
- Packages the data first before sending



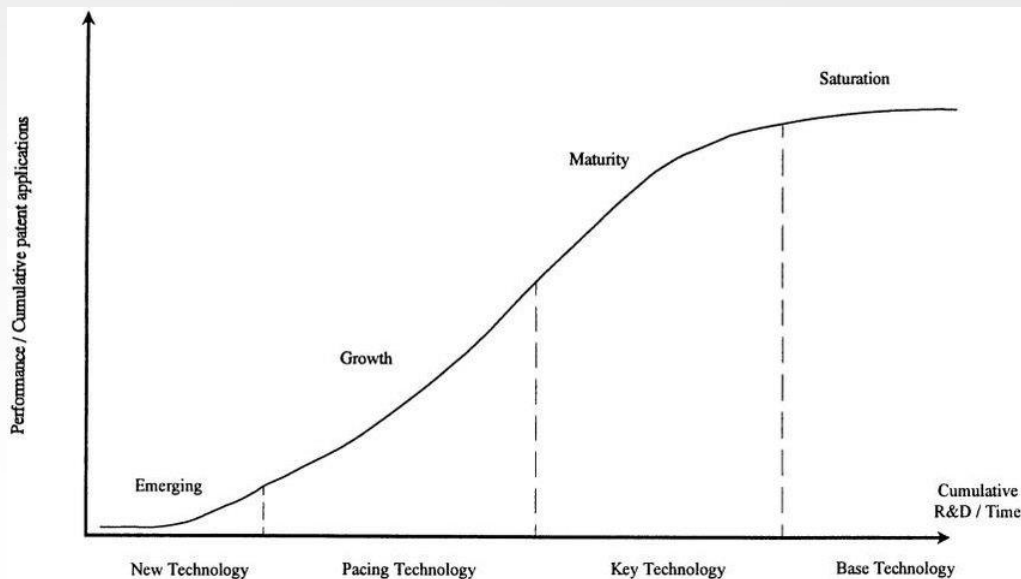


Virtual Reality



- ☐ Prototypes for customers when system is being designed
- ☐ Physical troubleshooting of plant problems
- ☐ Simulating HMIs and physics

S-Curve of Innovation



- It's said that technological adoption follows an S-Curve.
- In the beginning, new things come out of research and are still theoretical.
- Then a spark happens, and you have a large upswing in adoption.
- After the mass adoption, things start to taper off and run out of steam, and people begin looking for the next major innovation.

The Future



- Industry 5.0 is on the horizon
- Likely to represent a sort of small reversal from Industry 4.0 where human beings will become more engaged in industrial processes to add a sort of “human touch” again
- Adapting PLCs to new technology will create endless opportunities

Thank You!

QUESTIONS?