• What was the reason for developing
• What is new about “simplified teaching”
• How does it work
• Simplified Teaching? – Prove it.
• 80% of welding still done by hand
• Robotics is applied to high volume, low mix welding applications; automotive
• Need for more welding automation
  ◦ Labor savings required to stay competitive
  ◦ Lack of skilled workforce
• Barriers to Job Shop robot use
  ◦ Long set-up time to program the robot
  ◦ Skilled workforce required for programming
Robot programming has not changed in 30 yrs
Other technologies for programming
- Lead Through – generated path for paint
- Offline Programming – not shop floor easy
- Early solutions - Expensive

1998

Yaskawa Original Easy Teach

ET Handle to make easy to enter points

ET Pad to apply welding condition by expert system
Barriers to Job Shop robot use
  ◦ Long set-up time to program the robot
    • Device should reduce the time to create programs: responding to manual manipulation of torch position/orientation is more intuitive and faster than the use of axes keys to jog the robot.
  ◦ Skilled workforce required for programming
    • Programming tasks should be simplified for shop floor personnel: ICON based GUI’s are widely used to simplify smart phone apps and kiosks.

Device should be Safe and Cost Effective
  ◦ Teach pendant has color touch screen which can serve as HMI at $0.
  ◦ Teach pendant has Enabling Device and complies with current safety standard.
• New Simplified Teaching System
  ◦ Lead through manipulation for robot positioning
  ◦ Simplified ICON based graphic interface for creation of welding program; motion (points) and weld sequence
- Interface divided into display windows
ICON shapes and colors studied
Pendant vs. Kinetiq Video

https://www.youtube.com/watch?v=jzR5NZrZSu0&t=12
• Rapid Line, Grand Rapids, MI
  ◦ Job Shop for Steel Furniture OEMs
  ◦ 8 robot cells; 1 technician on days
  ◦ Operate 2 shifts x 7 days
  ◦ “Internet model” changed their business
    • Quicker delivery = smaller batches, shorter time
• Added Kinetiq Teaching to existing robot
  ◦ Goal to get welding staff to support day to day part programming and job changeover
• Training – ½ day for 6 personnel
  ◦ “students” were manual welding personnel
  ◦ No prior robot classes, some had experience jogging robot
  ◦ Class size was split and repeated; 4 – day shift and 2- 2nd shift
  ◦ Training Class
    • Instructor showed group how to program part 1 time
    • Students repeated exercise teaching program themselves.

Simplified Teaching – Prove It
• Warm up Exercise – Lap joint
  ◦ Show basics of how to program on straight line
  ◦ Yaskawa demonstrated teaching simple joint on trade show floor
    • Most can do it in a few minutes
Training exercise was ½ of CRAW coupon

Use of AWS CRAW* Coupon (1/2) for standardized training.

*Certified Robotic and Automated Welding personnel, AWS D16.4 Standard
Welders (6) quickly learned robot programming with Kinetiq Teaching

All 6 welders had similar training times - less than 10-15 min. for 1st robot

Key was all students “got it” and were able to complete task

Programming time per student
• Ask me about welders making programs

Use of AWS CRAW* Coupon (1/2) for standardized training.

Teaching Exercise

*Certified Robotic and Automated Welding personnel, AWS D16.4 Standard
Quickly adapted to their parts

Kinetiq teach time for lead Technician, but..
Quick to get “feel” of programming

G had less than 1 month employment at Rapid Line

41% Reduction in teaching time in just 4 trials

2nd weld sample by Operator G
Student was teaching parts next day
Limitations

- **Simplified Teaching Can:**
  - Be scaled to long reach robot arms
  - Support x-axis (must jog from pendant)
  - Provide simple Arc on files and comments
  - Export points to standard INFORM job
  - Be used by nearly anyone

- **Simplified Teaching Can Not:**
  - Support coordinated motion w/positioner
  - Support high end instructions: weave, sensors, etc.
  - Support multiple robot arms on same controller
  - Work with non-through arm robots
  - Replace at least 1 trained person on staff

Remember – Product designed to expand robots into job shops....not to support advanced robot users.
Anyone can use it

Kinetiq Teaching w/Positioner Axis