ACTEMIUM

TIPS & TRICKS FOR THE INTEGRATION OF COBOTS

VINCI ENERGIES

CONTENT

- Who am I and who is Actemium
- Robotic collaboration: an introduction
- What to consider before buying a collaborative robot
- What to consider during design a collaborative robot
- What to consider about after commissioning of a collaborative robot

WHO AM I AND WHO IS ACTEMIUM

- Civil engineering general mechanical engineering
- Almost 5 years, first job
- Branch manager focused on robotics/vision
- A love for horses, movies and cars

- VINCI ENERGIES
- Actemium= brand
- Network
- Industrial Automation – robotics – machinery

14
BUSINESS UNITS

900
ENGINEERS AND TECHNICIANS

€ 110 million
TURNOVER

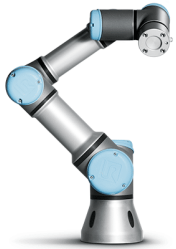
COLLABORATIVE ROBOTIC: AN INTRODUCTION

Industrial Cobot: Some examples

ABB – 0,5 kg
800 mm

Yaskawa –10 kg
1200 mm

Staubli
1450 mm



UR – 3-10 kg
1300 mm

KUKA – 7-14 kg
820 mm

FANUC– 4-35 kg
1813 mm

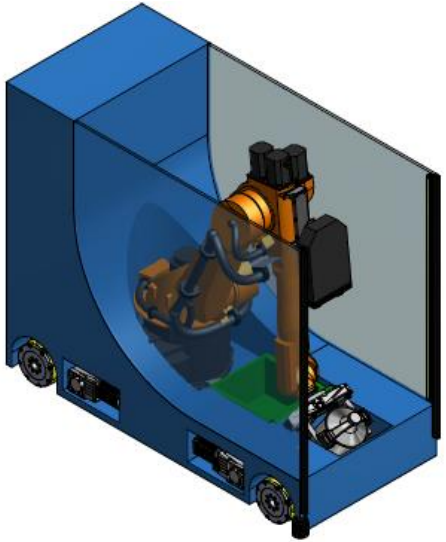
COMAU– 170 kg
2800 mm

Safety Technologies: pressure sensitive skin, pressure-force-moment sensor in footbase or each axis

Future? Infrared, temperature: non-contact

COLLABORATIVE ROBOTIC: AN INTRODUCTION

Industrial Cobot: Some examples

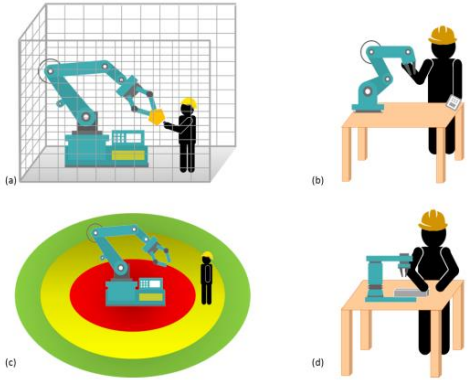


Safety Technologies: Scanners

WHAT TO CONSIDER BEFORE BUYING A COLLABORATIVE ROBOT

- What is your motivation: Innovation, ergonomical, space limitation, repetitive work reduction for operators – replacing operators : you might reconsider
- What is your budget: cobots often tend to be a bit more expensive
- What is the desired degree of collaboration?
  - Contact with robot? Fe hand guiding
  - Contact with peripheral devices?
  - Only passing through at close distant?

Also collaboration:



- Is it possible to regularly stop your cobot or do you rely on a continuous process?
  - How many times does the operator have to enter the robotic area?
  - How long does it take
  - Pre induced robot stop is possible without cobot with fe scanner

WHAT TO CONSIDER BEFORE BUYING A COLLABORATIVE ROBOT

	0	1	2	3	4
Touching frequency (0 = never; 4 = continuous)				X	
Passing frequency (0 = never; 4 = always at robot)				X	
Passing distance (0 = 3m ; 4 = 0m)					X
Desired Continuity of robot/machine line (0,4 = no stops allowed; 1 = some stops/slowing allowed; 2 = regular stops/slowing allowed; 3 = always stops/slowing allowed)			X		
Picking/placing items in proximity robot toolcenter :frequency (0 = never; 4 = more than 10 times per hour)			X		
Operator handsfree (0, 1 = both hands free; 2,3,4 = both hands full)			X	X	X
Guideline of system	Conventional robot with fence	Conventional robot with fence And request and confirmation for organized robot stop	Conventional robot with safety controller in combination with safety scanner (or light curtains) for induced robot stops	Cobot with floor/safety scanner which can switch to fullspeed mode	Full Cobot

WHAT TO CONSIDER BEFORE BUYING A COLLABORATIVE ROBOT

- What is the desired working speed? Or combination of cobotspeed and fullspeed? Magic 250 mm/s => otherwise at least 50 cm distance: additional safety requirements
- Are there any other machine speeds depending on this cobot cell? => perform a cycle time simulation on your cobot cell or ask your integrator
- Scanners have advantages, but also disadvantages
- What about peripheral devices and their safety?
- What is the robotic environment? (temperature, dust, humidity, cleanroom, food grade)

WHAT TO CONSIDER BEFORE BUYING A COLLABORATIVE ROBOT

- Some inspiration for applications: accuracy, speed, simplicity and degree of collaboration
  - Quality detection
  - Gluing, foam or liquids application, dispensing, filling, poslishing, cleaning
  - Machine tending
  - Screwing: force-torque sensor or in-house
  - Assembly: force-torque sensor or in-house
  - Pick and place

- Is your operator ready for collaboration?
- Accept the fact that their might be additional costs due to pre-engineering

WHAT TO CONSIDER DURING DESIGN A COLLABORATIVE ROBOT

- Always perform a risk assessment!
- Noise-people can't hear the robot moving & may have to wear ear protection
  Visibility–mists/dust/smoke can impair people's ability to see robot motion in the workspace
- Area and environmental restriction –anything in the workspace between the human and robot has to be considered a crush/pinch/slip/trip hazard. Cables/items on the floor are trip hazards. Humidity or leaking glue also
- Tooling:
  - Suction cups: safe but beware of edges/points/clenching
  - Clamping: select a collaborative jaw gripper with force limiting
    but make sure your product doesn't fall: calculate
  - Welding/gluing/filling: beware of temperatures/chemicals
  - Pick and place: Payload: what if load falls off (for the heavier cobots)
  - Take inertia into consideration for heavy payloads!

WHAT TO CONSIDER DURING DESIGN A COLLABORATIVE ROBOT

- Performance Impact: Tooling can end up heavier/slower & more expensive due to covers and additional safety equipment.
- Risk parameters: S Severity of injury, Frequency and/or duration of exposure to hazard, P Possibility of avoiding the hazard or limiting the damage (ISO 13849-1=machinery) (ISO 10218= industrial robots) (ISO/TS 15066 = Cobots)
- Clenching is also a danger!
- Cyber security protection

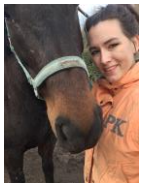
Industrial robots:
S2 – F2 – P1 = Performance Level d

- If full robot mode alternation is desired; make sure operators can't just switch: password and hardware protection
- Ask a professionnal

WHAT TO CONSIDER ABOUT AFTER COMMISSIONING OF A COLLABORATIVE ROBOT

- Spare parts! Ask your integrator/supplier
- Programming knowledge: training or support
- Don’t just create a new recipe/program or tooling: EVERY change = new Risk Assessment

ACTEMIUM CAN HELP YOU WITH YOUR COBOT QUESTIONS



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