



MCA Costing Exercise - DREAM

15.09.2016 | Harald Kleines/Frank Suxdorf/Peter Harbott presented by Thomas Gahl





Boundary Conditions for the Calculation

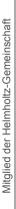
- Mechanical Construction incomplete =>
 - Actuators and Sensors not properly defined
 - Mechanical construction is continuously changing
- Motion Control list of allowed devices is under development
- No final decision on the allowed electronics components
- Some open issues in the interface between ESS and in kind partners => consequences for labor costs
- => Only rough estimation is possible





General Approach

- Starting Point: MCA Table defined by the Motion Control Group
- Extend it by two additional columns for
 - Sensors (switches, encoders, ...) and actuators (motors, pneumatic elements,...)
 - Electronics (PLCs, motor controllers, frequency converters, SSImodules, connectors, cables
- Assume costs according to axis type (pneumatic, stepper motors with or without encoders, AC drives,....)
- Fixed costs (racks, PLCs,...) are linearly distributed
- Define the labor costs according to work packages and assume an average price per FTE



JÜLICH FORSCHUNGSZENTRUM

MCA Table

	Α	В	С	D	Е	F	G	Н		J	K
1	Instrument										
2	Re v.	1									
3	Axis	Device Description	Motion Type	Actuator Type	Accuracy (mm/°)	Vacuum	Location	Distance from moderator (m)	Notes / Comments	Cost for motors, encoders, switches,	Cost for Electronics
4	1	Bispectral switch	Translation	Electrical	0,1	Atmosphe re	Bunker	6		2000	1500
5	2	Bispectral switch	Rotation	Electrical	0,01	Atmosphe re	Bunker	6		9000	2500
6	3	Heavy shutter 1	Translation or Rotation	Pneumatic	0,01	Rough Vacuum	Bunker	22	Slope for horizontal, Safety iussue?	2000	1000
7	4	Slit 1	Translation	Electrical	0,1	High Vacuum	Cave	75,5	in / out, Piezo	4000	2500
8	5		Translation	Electrical	0,1	High Vacuum	Cave	75,5	in / out, Piezo	4000	2500
9	6		Translation	Electrical	0,1	High Vacuum	Cave	75,5	in / out, Piezo	4000	2500
10	7		Translation	Electrical	0,1	High Vacuum	Cave	75,5	in / out, Piezo	4000	2500

- Costs for motors etc. differ very much from requirements:
 - Application in bunker: High radiation,
 - Pneumatics tend to be cheap in control
 - Piezo control in high vacuum are expensive
- Overall sum: 135.500 €





Labor Costs

- Rough Definition of Work Packages:
 - Schematic drawings: 2 MM
 - Construction of electrical cabinets: 5 MM
 - Engineering and project management: 5 MM
 - Motion Control SW (PLC,..): 6 MM
 - PC Software (Linux): 4 MM
 - Pre-Commissioning in Jülich: 4 MM
 - Installation and cabling in Lund: 2 MM
 - Commissioning in Lund: 4 MM
 - Total: 32 MM = 2.7 FTE
- Total labor cost: ca. 300.000 €
 - Assumption: Average FTE cost is ca. 110.000 € per year





Time Line

- Mapping to the timeline is quite open
- => possible approach: linear distribution

	01 Phase 1	02 Project Management & Integration	03 Design	04 Procurement & Fabrication	05 Installation	06 Cold Commission ing	Total
07 Motion Control and Automation	€0	€ 60 000	€ 60 000	€ 195 500	€ 60 000	€ 60 000	€ 435 500

 => better approach is to distribute the different work packages (last slide) to the different phases of the project