

Challenges in Establishing Laboratories in Developing Countries

Murphy's Law
OR
Pitfalls & lessons learned

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TOPICS AGENDA

- (A) Projects and their constraints
- (B) New construction or major refurbishment
- (C) The laboratory design process
- (D) Laboratory engineering
- (E) Material selection and quality control
- (F) Supervision of construction
- (G) Commissioning of construction and engineering
- (H) Installation and commissioning of equipment

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Projects worldwide ...



Common constraints ...

- developing countries usually are recipients of technical and/or financial aid, but the
- use of foreign aid funds often restricted to equipment and training; not usable for major construction
- therefore countries -apart from their obligation to provide the land- often have to bear also the cost of construction with the limited resources they have

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A frequent situation: ...

“no funds for construction ...but may be an existing (usually an old) building that could be made available”

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A frequent situation: ...



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Major refurbishment or new construction ?!?

- most who have gone through such process know what a headache it can be to renovate or refurbish and try to convert an old building into a modern laboratory
- one should also be aware that at the end of the process a major refurbishment may turn out to be more expensive than a new construction
- in any case: >> look at what is the general construction environment and experience in the country including what kind of materials are available locally

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The laboratory design process

- **Design team** (lab owner, lab users, lab specialists, engineers, architect, etc)
- **Design strategy** (tasks, area required (quantitative), area specification (qualitative), area logistics, engineering, architecture, planning, interior design, implementation & supervision)
- **Not a straight forward** process – requires repeated coordination and synchronization with the user and other members of the design team (development of draft proposals, choice of best option, master plan for larger projects)



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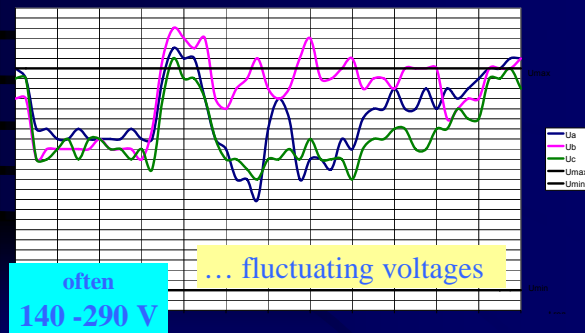
Laboratory engineering ...

- **Electricity** > unstable, frequent interruptions, scheduled power cuts
- **Water** > shortages, scheduled supplies, low pressure
- **Gas** > laboratory gases usually need to be imported
- **Air management** > an unknown or unfamiliar concept (for labs)
- **Laboratory safety** > severely neglected

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Electricity problems ...

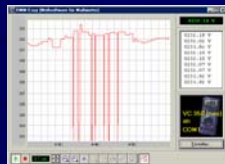


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Electricity problems ...

... frequent power cuts



Overloaded and malfunctioning voltage stabilizers



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Electricity problems ...

... "easy fuses" ...

Special practices



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Water supply problems ...

Water: > shortages, scheduled supplies, low pressure



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Laboratory gas supply ... central / local

Gas > laboratory gases usually need to be imported (expensive)

Alternative:

... gas generators

Service ?

Gas supply by rickshaw



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Laboratory air management

- air circulation / air exchanges
- replacement of exhausted air
- pre-conditioning of incoming air
- cost factor usually underestimated



Two choices ...



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Material selection and quality control ...

- Tendency to buy the cheapest materials
- Quality control becomes a must
- Examples > windows, metallic items (SS), plastic ware, electric sockets, etc

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Material selection and quality control ...



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Material selection and quality control ...



T > 180°C

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Supervision of construction or refurbishment ...

> task of the supervising engineer !?

- Positioning of windows and doors
- Door sizes (width, height, direction of opening)
- Positioning of electric sockets
- Electric wiring and circuit breakers
- ...

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Commissioning of construction and engineering ...

... another couple of surprises ...

- Electric wiring, safety, CBs, earthing
- Gas and water supply
- Air-conditioning
- Fume hoods
- Power generators



>>> two examples >>>

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Air-conditioning & ventilation

- performance checks
- temperature / humidity / time
- Exhaust volumes & face velocity
- Pressure difference (inside / outside)

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Air-conditioning & ventilation

Problem: room not equally cooled



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Air-conditioning & ventilation

Problem: ACU failed

Rat damage: eaten up the
T sensor cable

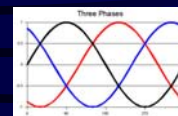


Problem: no exhaust ...
unsuitable duct material

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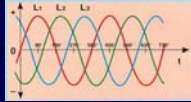
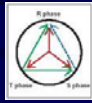
Power generators ...



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Power generators ...



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Installation and commissioning of equipment ...

- receiving, checking & positioning
- electrical connections
- performance tests
- operator training (usually software driven)
- qualification of local engineers

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Test gear useful for commissioning

- DMM
- Clamp meter
- Recording devices
- Water pressure indicator
- Anemometer
- Leak detector
- Temp./r.H. recorder



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It might have been a challenge ...



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May be the biggest challenge is ...

Finding people that are ...

- Dedicated
- Greatly motivated
- Willing to read & learn more
- And all this for a salary of 100-200 USD
- a month ...

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Think about it

Thank you

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