

15th Seminar of the LIBER Architecture Group
National Library of Spain, Madrid, 15. April 2010

Energy restoration of the Bremen library and the impact on the user

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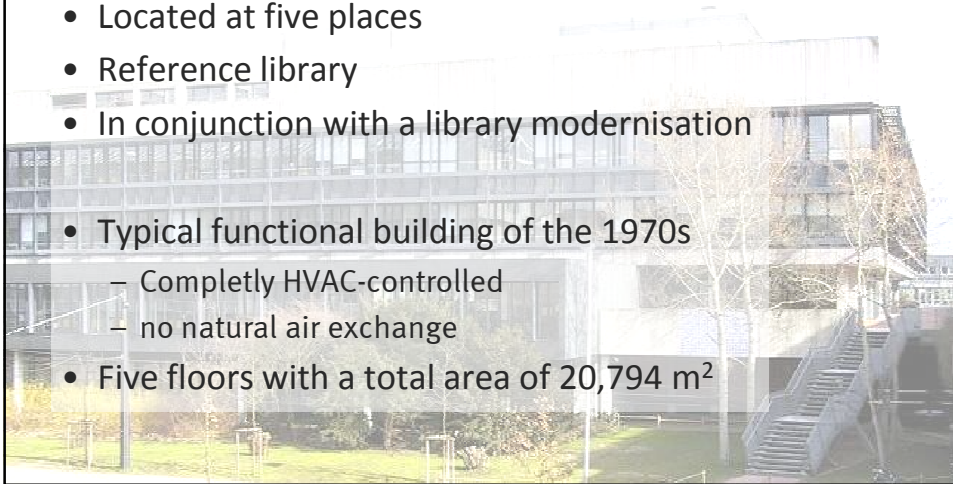
Project history

- Diploma thesis in 1999
- Project period: 2001 to 2007
- Co-operation between
 - University of Bremen, building department
 - User of the library
 - Technical designer team
 - Scientific consulting and monitoring
- Supported by the Federal Ministry of Economics and Technology

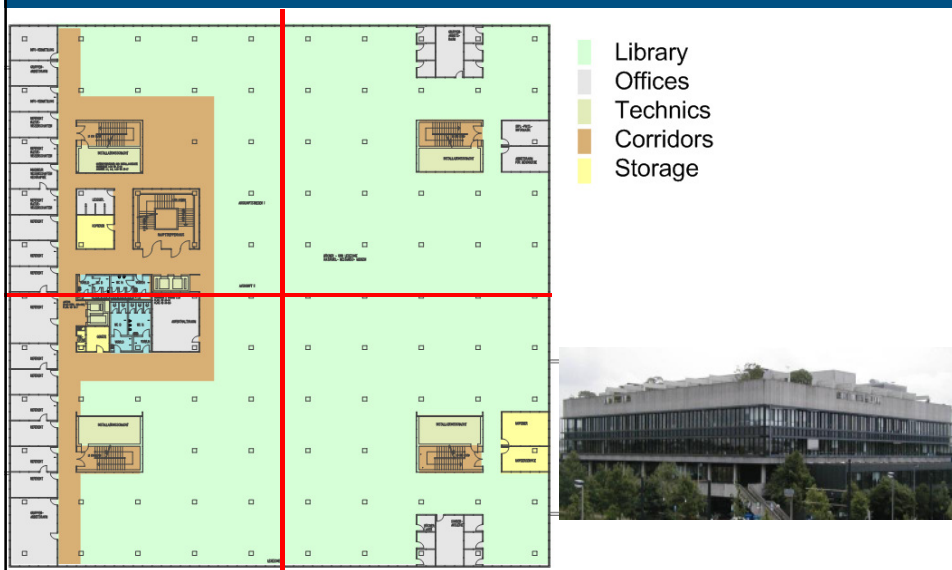


State and University Library Bremen (SuUB)

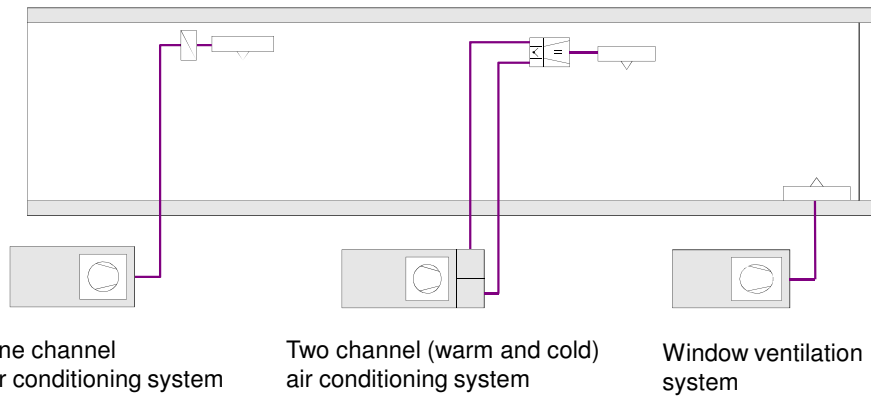
- 2010: 350 year anniversary
- Located at five places
- Reference library
- In conjunction with a library modernisation
- Typical functional building of the 1970s
 - Completely HVAC-controlled
 - no natural air exchange
- Five floors with a total area of 20,794 m²



Floor plan (2./3. floor)



The heating and air conditioning system prior to restoration

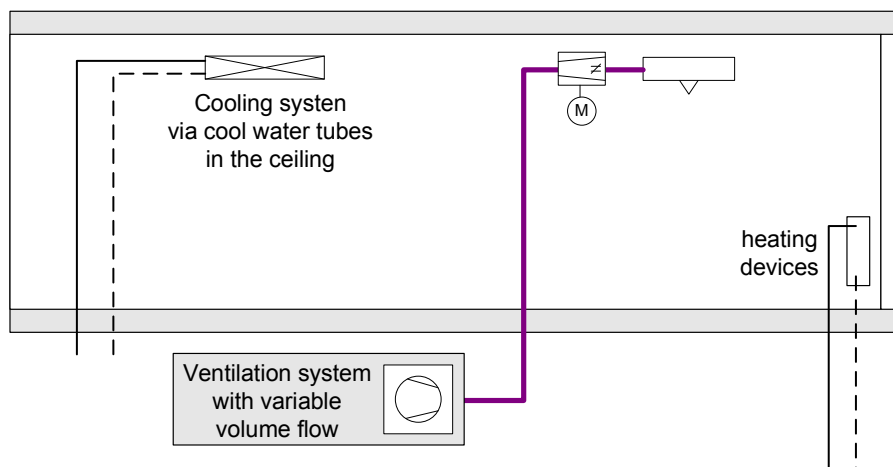


One channel air conditioning system

Two channel (warm and cold) air conditioning system

Window ventilation system

The heating and air conditioning system after the restoration

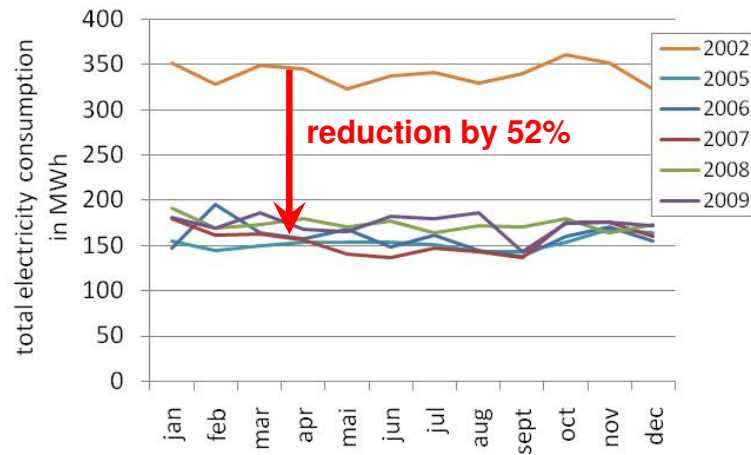


Ventilation system with variable volume flow

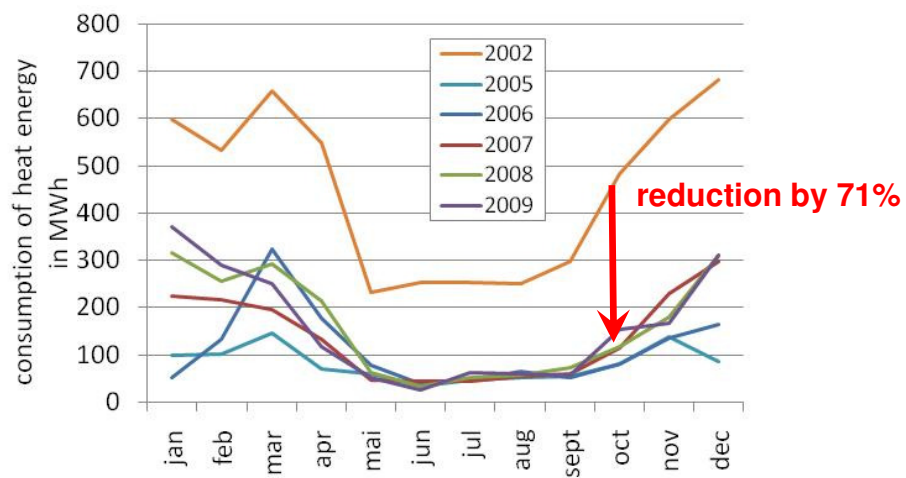
heating devices

Cooling system via cool water tubes in the ceiling

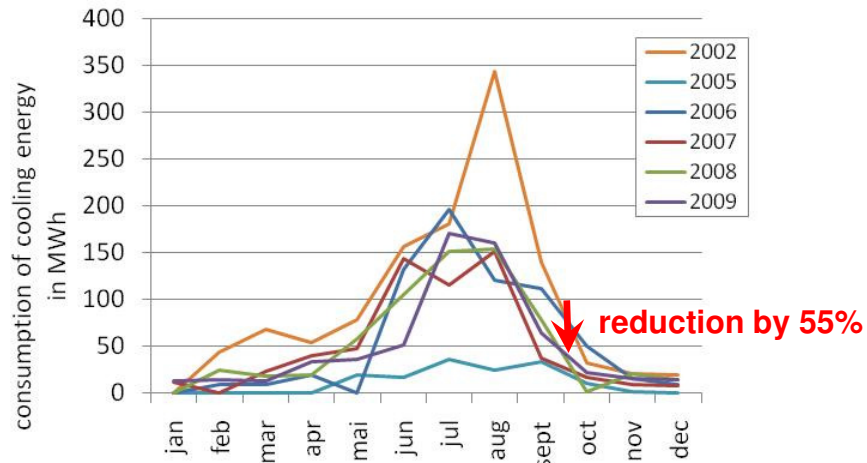
Reduction of total electricity consumption



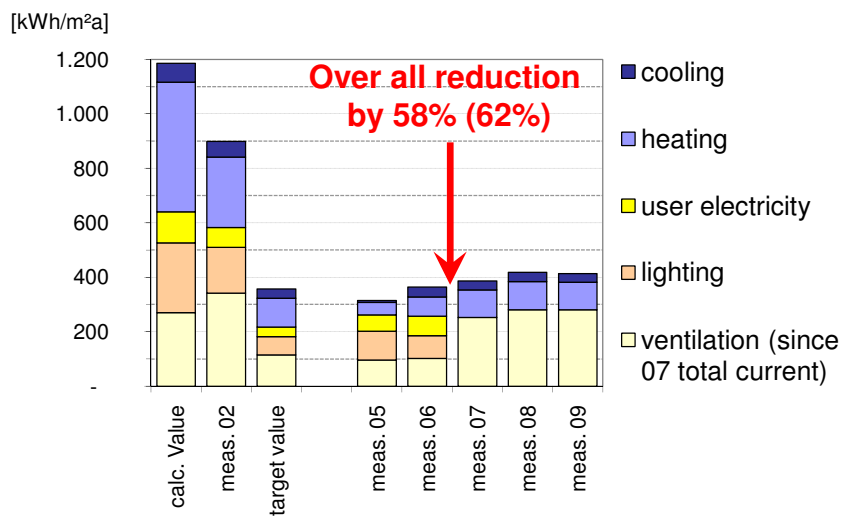
Reduction of heat energy consumption



Reduction of cooling energy consumption



Annual Primary Energy Consumption



Lighting

Hochschule Bremerhaven

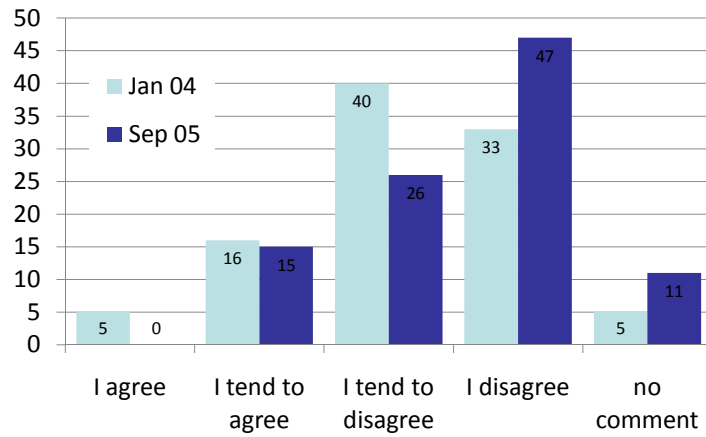


Socio-scientific research

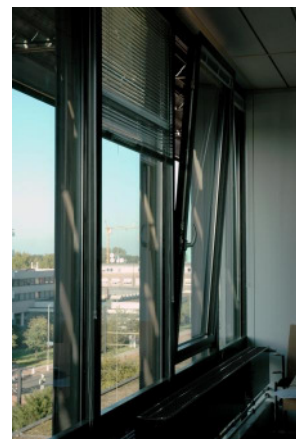
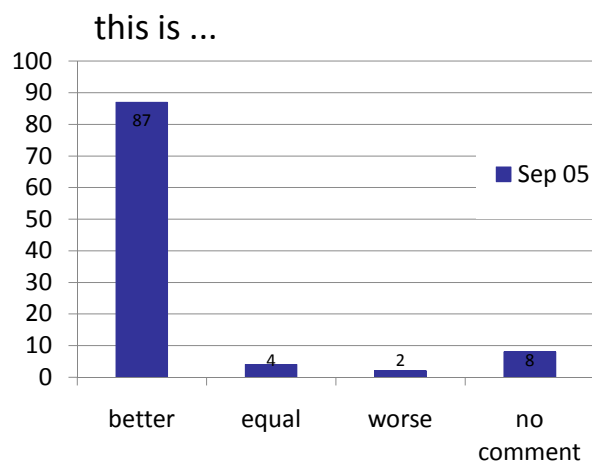
Hochschule Bremerhaven

- Discomfort/problems prior to restoration:
 - The windows could not be opened
 - Too much noise (because of the ventilation)
 - Dry or bad air
 - Temperature discomfort
- Student project of a social science study program

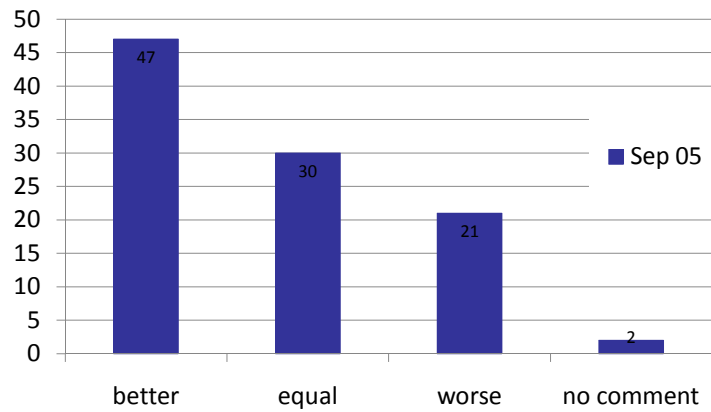
The energy restoration was not necessary



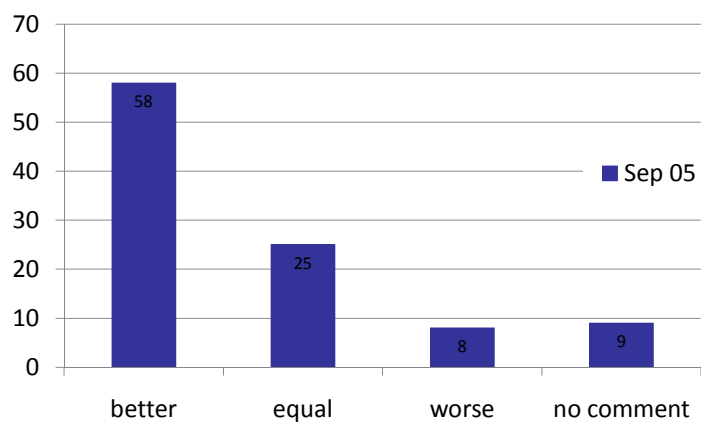
The windows can now be opened after restoration



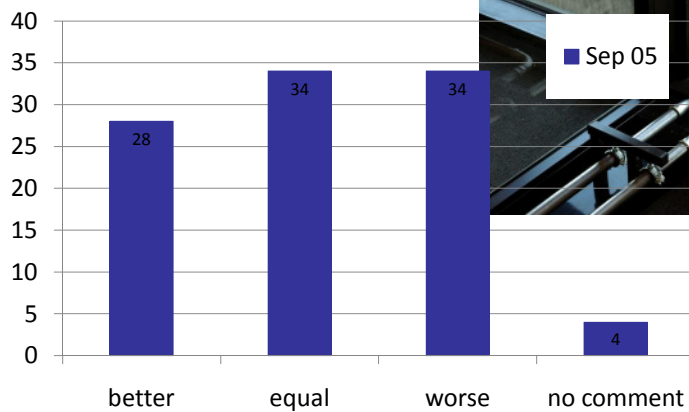
Impact of noise after the restoration



Response regarding dry air



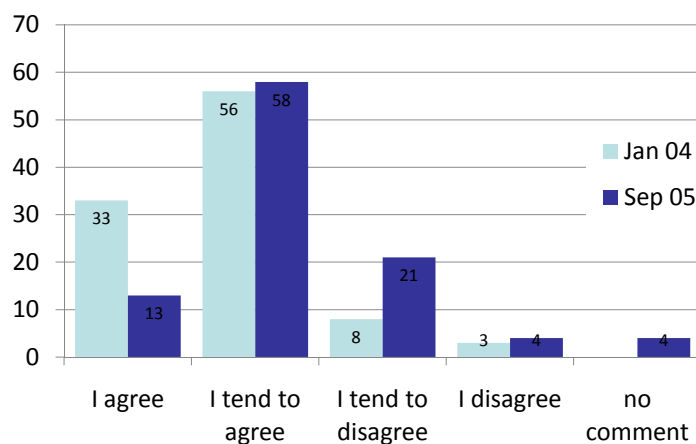
Temperature control



User influence

The lack of influence was frustrating (prior to restoration, Jan 04)

Because of the higher influence, I feel better (after restoration, Sep 05)



Students area and info desks



Conclusion

- The library was in regular use during the energy restoration
- An overall energy reduction of about 60% was achieved
- The energy restoration resulted in a significant user comfort increase esp. in the area of
 - air conditioning and
 - lighting