LMS
Load Management System
Overview
Ripple Control Technology
The Demand Problem

Demand is charged on the **maximum**, even if it’s only for one billing period.
How to solve the demand problem?

- Filling of day-time valleys
- Peak reduction
- Filling of night-time valleys

- Heating systems
- Air-conditioning
- Water heating
- Irrigation pumps
- Industrial plants
- Tariff control

- Storage heating systems
- Storage water heating
- Any short of thermal storage
- Irrigation pumps
- Tariff control
But how to control ..

... all these consumers, generators and meters which are distributed all over the network
Ripple Control system use the existing energy network for communication. Audio-frequency signals will be added to the 50/60 Hz power supply net.

The information will be sent as a serial telegram built by pulses with this audio frequency signal.
The control master generates all commands and supervises the substation equipment.

The transmitter generates the audio frequency which is injected into the network via the coupling. The local controller normally receives all commands from the control master but can also generate own commands in case of missing communication to the control master.

The Receivers filter the audio frequency out of the network and decode the ripple telegram. The can also do time dependent switching. For control of the consumers the receivers have 1 to 6 relays.
Applications for Ripple Control Systems
Time and event dependend control

Meter control
Switching time of use tariffs depending on daytime, weekday, date range, special days, net work load. Synchronization of meter clocks.

Time and event dependent Consumer and Generator Control
depending on daytime, weekday, date range, special days or depending on binary inputs

e.g. heaters, boilers, pumps, warm pumps, irrigation plants, robot synchronization, air conditioning …

Street Light Control
Control streetlights or object lighting depending on Brightness, calculated dawn times or at fixed times

In contrast to a timer switch, switching times may be changed at any time and additional switchings depending on other conditions then time are possible!
Applications for Ripple Control Systems
Load Control and Duty cycle Control

Automatic load management
- depending on network load
- controllable objects:
  - heaters, boilers, air conditioning, generators,
  - warm pumps, freezer, washing machines,
  - irrigation plants …

Duty Cycle Control
- takes care on duty cycle rules for objects controlled by automatic load management
Load control master LMM610

LAN (Ethernet-TCP/IP)

Operator Workstation (Internet Browser)

mobile Workstation (Internet Browser)

LMM 610 Base system A

LMM 610 Base system B

switch over unit

LMC 610 Substation 1

LMC 610 Substation n
Load control master LMM610 Display

### Daily work schedule

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Object name</th>
<th>Description</th>
<th>Action</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>23:00</td>
<td>Q_USER1</td>
<td>summer</td>
<td>start</td>
<td>00:00:00</td>
</tr>
<tr>
<td>2007</td>
<td>23:00</td>
<td>Q_USER2</td>
<td>winter</td>
<td>start</td>
<td>00:00:00</td>
</tr>
<tr>
<td>2007</td>
<td>23:00</td>
<td>Q_USER3</td>
<td>autumn</td>
<td>start</td>
<td>00:00:00</td>
</tr>
</tbody>
</table>

**OPTIONS**

- [ ] Reset time range
- [ ] Add single object control
- [ ] Add single receiver control
- [ ] Add load object control
- [ ] Add program control
- [ ] Add event Log
- [ ] Manual Generation
- [ ] Go to currently

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RTS 600 - Ripple Control Transmitter for medium voltage

Maximum nominal power (pulse power):
80, 120 or 200 kVA

Audio frequency range:
110 – 1350 Hz
RTS 640 - Ripple Control Transmitter for high voltage

Maximum nominal power (pulse power):
400 - 2400 kVA

Audio frequency range:
168 – 383 Hz
Parallel Coupling type RAP for medium voltage injection
Parallel Coupling type RAP for high voltage injection
Serial Coupling Transformer type RAT

Casting raisin insulated
LCR - Ripple control receivers

LCR 500/540
1 – 4 Relays, 25/40A

LCR 444
1 - 4 Relays, 16A

LCR 140
1 Relay, 6A

LCR 544
1 – 4 Relays, 40A (6A)
DIN rail design

LCR 120
1 Relays, 40A (6A)

Test transmitter LTS500

LCR 220/230
2 Relays, 16A
for street light pylons
Remote parametrisation

- Synchronisation of meter date and time
- Remote parametrisation of the time programs in the LCR-microcontroller

Ripple control command or internal LCR time program

- Tariff switching
- Demand reset
- Relay switching
Example Projects

OVAG, Friedberg, Germany

Regional Utility

Doublecomputer LMM610
32 Medium Voltage Injection Plants

Individual manual control of 7000 single receivers (bad payers and street lights) selectable from a database
Example Projects

City of Windhoek, Namibia

Utility of Windhoek, Capital of Namibia

Doublecomputer LMM610
1 High Voltage Injection Plant (66 kV)
Loadmanagement by hot water control
Example Projects

NUON, Arnhem, The Netherlands

Regional Utility for Gelderland, Friesland and Nordholland

Doublecomputer LMM610
3 Medium Voltage Injection Plants (20kV) and 7 High Voltage Injection Plants (50 – 150 kV)

Street Light Control, TOU tariff control
Example Projects

Nelson Mandela Bay Municipality, Port Elizabeth, South Africa

Regional Utility

Doublecomputer LMM610
1 Medium Voltage Injection Plants (20kV) and 1 High Voltage Injection Plant (132 kV)

Loadmanagement by hot water control
References

- **Control Systems**
  - LCM500 (1990 – 1998): 51 Systems delivered to Germany, Finland, Switzerland and Netherlands
  - LCC500 (1993 – 1999): 34 Systems delivered to Germany, Finland, Sweden, Czech Republic, Australia, Namibia and Croatia
  - LMM610 (1999 – now): 87 Systems delivered to Germany, Switzerland, Brazil, Benelux, Finland, Portugal, Hungary, Namibia, Croatia and South Africa
  - LMM700 (2007 – now): 3 Systems delivered to Germany

- **Transmitter and Injection Plants**
  - 75 High Voltage Systems (60 – 150 kV) delivered to Germany, Netherlands, Hungary, Croatia, Brazil, USA, Australia, Namibia and South Africa
  - More than 1000 Medium Voltage Systems (6 – 50 kV) delivered worldwide
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