VOLTAGE POWER OPTIMISATION:

ENERGY EFFICIENT FACILITIES FOR MUNICIPALITIES
efficient voltage optimising eliminates energy waste
definition

• an electrical energy saving technique
• supplies an optimum supply voltage
• also corrects power quality problems
• not just merely a reduction of volts

• WIKIPEDIA: http://en.wikipedia.org/wiki/Voltage_optimisation
Voltage supply

Service level supply range: ±10%

207V, 216V, 220V, 230V, 244V, 253V

Stable voltage supply
POWER OPTIMISA

Excess Voltage
VOLTAGE OPTIMIZATION PROCEDURE

Manages voltage levels to a pre-set range

INCOMING VOLTAGE

OUTCOME SAVINGS FROM E-FOUR

NEEDED VOL = OUTCOMING VOL
VOLTAGE POWER OPTIMIZATION
Principles

• Ohms Law: $P = I \times V$

• $I = \frac{V}{R}$

• $P = \frac{V^2}{R}$

• $R = \text{constant in any facility}$

• Resistive loads save energy $P$ in a square relationship to volts

• Inductive loads behave predominantly in linear manner to volts
VOLTAGE POWER OPTIMIZATION

not just volts

• saves both energy (kwhrs) and load (kva)
• power factor improvement
• phase voltage imbalance improvement
• reduced neutral currents
• eases off system stress
• protects site from surges
• protects equipment generally
LETS JUST TAP DOWN!

- conventional transformers inefficient [-95%]
- voltage optimisation super efficient [±99.9%]
- extent of voltage range managed [5% vs 15%]
- tap down = a fixed % volts reduction
- voltage power optimising = managed to a level
- tap down for Munics will waste energy: either as above; or lose kwhrs in billings if they inefficiently tap down for their customers
### Voltage Effect on Lighting

<table>
<thead>
<tr>
<th>Load Type</th>
<th>Intensity</th>
<th>Power (watt)</th>
<th>Life</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Incandescent</strong></td>
<td>90%</td>
<td>95%</td>
<td>100%</td>
</tr>
<tr>
<td>Intensity</td>
<td>70</td>
<td>84</td>
<td>100</td>
</tr>
<tr>
<td>Power (watt)</td>
<td>85</td>
<td>92</td>
<td>100</td>
</tr>
<tr>
<td>Life</td>
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<td>200</td>
<td>50</td>
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<tr>
<td><strong>Fluorescent</strong></td>
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<td>95%</td>
<td>100%</td>
</tr>
<tr>
<td>Intensity</td>
<td>84</td>
<td>93</td>
<td>100</td>
</tr>
<tr>
<td>Power (watt)</td>
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<td>91</td>
<td>100</td>
</tr>
<tr>
<td>Life</td>
<td>95</td>
<td>102</td>
<td>92</td>
</tr>
<tr>
<td><strong>Compact Fluorescent</strong></td>
<td>90%</td>
<td>95%</td>
<td>100%</td>
</tr>
<tr>
<td>(energy savings)</td>
<td>95</td>
<td>98</td>
<td>100</td>
</tr>
<tr>
<td>Intensity</td>
<td>94</td>
<td>97</td>
<td></td>
</tr>
<tr>
<td>Power (watt)</td>
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<td>97</td>
<td></td>
</tr>
<tr>
<td><strong>Halogen</strong></td>
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<td>95%</td>
<td>100%</td>
</tr>
<tr>
<td>Intensity</td>
<td>70</td>
<td>84</td>
<td>100</td>
</tr>
<tr>
<td>Power (watt)</td>
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<td>92</td>
<td>100</td>
</tr>
<tr>
<td>Life</td>
<td>-</td>
<td>168</td>
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</tr>
<tr>
<td><strong>Sodium</strong></td>
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<td>95%</td>
<td>100%</td>
</tr>
<tr>
<td>Intensity</td>
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<td>90</td>
<td>100</td>
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<tr>
<td>Power (watt)</td>
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<td>91</td>
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<tr>
<td><strong>Metal Halide Lamps</strong></td>
<td>90%</td>
<td>95%</td>
<td>100%</td>
</tr>
<tr>
<td>Intensity</td>
<td>66</td>
<td>83</td>
<td>100</td>
</tr>
<tr>
<td>Power (watt)</td>
<td>79</td>
<td>90</td>
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</tbody>
</table>

*Official data in Panasonic/National Lamp Catalogue*
SAVINGS by LOAD TYPES

EFFECT OF VOLTAGE VARIATION
ON “T” FRAME MOTORS

Graph from Baldor Electric Co., Wallingford, Conn.,
THE MUNIC OPPORTUNITY

- Eskom tariff hikes, PCP’s, new DME funding, budget savings, more than pays for itself

- Many municipalities premises are operating at a voltages higher than nominal.

- Easy quick compatible savings – just optimising energy

- Proven technology
100’s municipality users overseas – examples
continued – examples
Power Utility use – examples

“Take control of your energy consumption with voltage optimisation technology”

John Winters, Line of Business Manager
Eskom report conclusion: The unit has effectively reduced both the demand and energy consumption at the client’s site.
Any questions?

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The New County Offices’ 15 storey building in Aylesbury is the focus point of the Council’s administration with 750 employees working on a daily basis alongside a sophisticated electronic infra-structure. It is fully air conditioned and prior to the powerPerfector installation was already an energy efficient building with high frequency lighting and building control systems.

- **Overall Energy Consumption** has been reduced by 13.1%
- **The Maximum Demand** has reduced by 10%
- **The Power Factor** has stabilised and improved significantly
- **Harmful Peak Harmonic Distortion** has been reduced by 12%
- **Current in neutral** has been reduced by 7%
- **Phases** are more evenly balanced
- **Annual saving £12,000**, 25 month payback, 48% ROI and 82tons of CO2 saving
- **The Council is rolling out the technology in its other buildings.**
INSTALLATION

• Units are custom manufactured and delivery is typically less than 9 weeks

• Installation requires a full shut down and is usually performed outside of normal business hours

• Power shutdown normally takes no longer than 1 to 2 hours

• Attached directly to the power source itself, focusing on the raw power quality as it enters the building.
SAVINGS by LOAD TYPES

LIGHTING

System Efficacy vs System Voltage

Source: European Copper Institute - original test data adjusted to 240V mains