

Harmonic distortions from LED lighting in industrial buildings

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University of Ruse

Lux junior 2019



UNIVERSITY OF RUSE CAMPUS MAP



- 1 Central building / Rectorate
- 2 Building 2
- 3 Materials Science and Technology
- 4 Thermotechnics
- 5 Laboratory building of Engines and Transport Equipment
- 6 Electrical and Electronic Engineering and Automation 2
- 7 Electrical and Electronic Engineering and Automation 2
- 8 Agricultural mechanisation
- 9 Hydraulics
- 10 Electrical and Electronic Engineering and Automation 1
- 11 Mechanical Engineering Technologies 2
- 12 Mechanical Engineering Technologies 3
- 13 Ecology and Environmental Protection 2
- 15 Lecture building
- 16 Industrial Design
- 17 Instrument-building Research Institute 1
- 18 Ecology and Environmental Protection 1
- 20 Transport Department
- 21 Electric Distribution Unit
- 22 Laboratory of Hydraulic and pneumatic systems in Automotive Techniques
- 23 Laboratory of Engine Electronic Control Systems
- 24 Explosive treatment
- 25 Vacuum Technologies and Systems 1
- 26 Vacuum Technologies and Systems 2
- 27 Laboratorial building
- 28 Kaneff centre
- P Parking lot



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The use of LED lights is now also targeting on the industry, which, until a few years ago, has created complications and sometimes inability to use them. With the use of modern materials and electronic components, a number of difficulties have been overcome in the creation of industrial LED lighting fixtures. LED Luminaires with a very good optical system, high light output LED modules, very good cooling systems and, of course, improved power supplies are already in use.

The purpose of the study is to determine some electrical parameters of already built-in LED industrial lighting fixtures and to assess their impact on the energy system.

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Figure 1. LED industrial luminaire Variant P60

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Technical characteristics of the tested luminaire

Model	Variant P60
LED Chip	CITIZEN
LED Driver	Meanwell
Power	60 W
Power factor	> 0.95
Power supply	110 – 260 V
Luminous flux	7800 lm
Color temperature	5000 K
Color rendering index (CRI)	80
Temperature working range	- 35° до + 60°
Internal Protection	IP 54
Lifetime	> 50 000 h
Case	Aluminum

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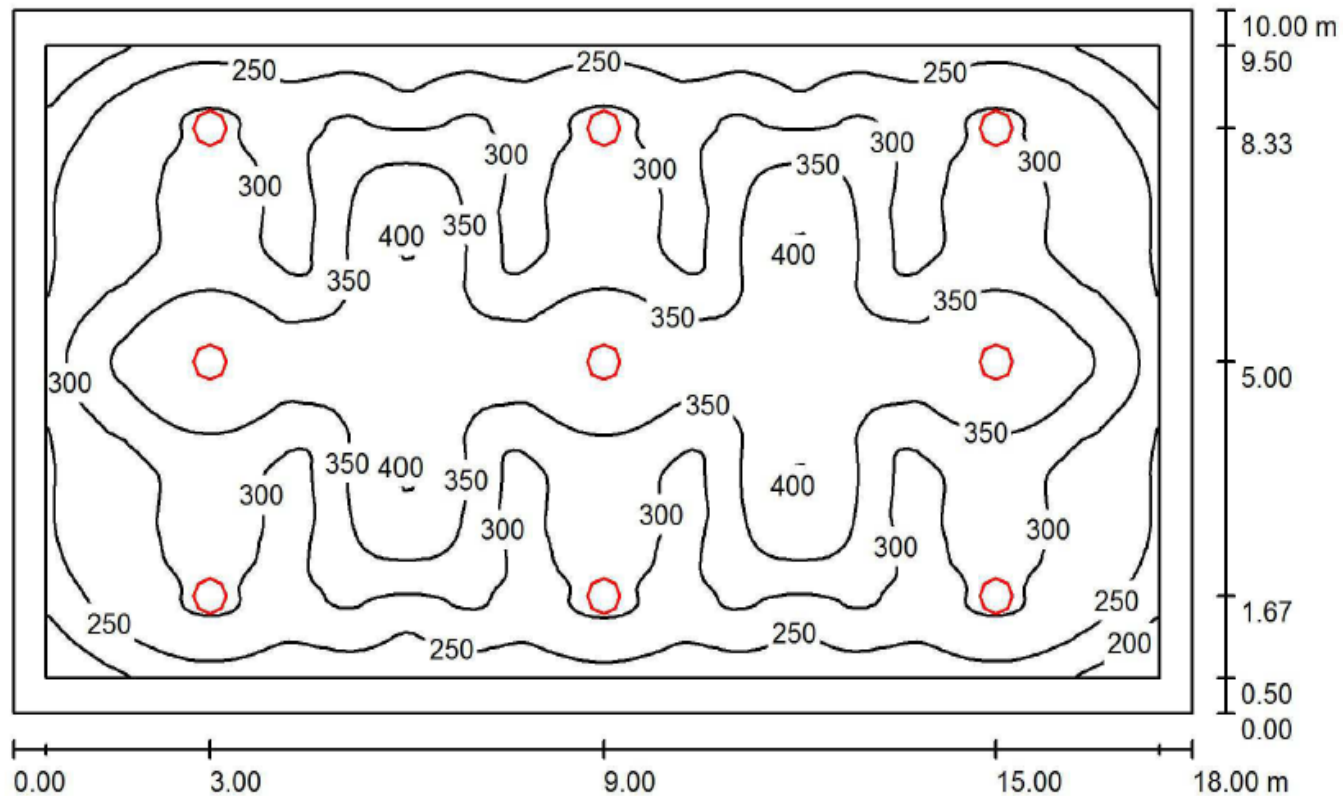


Figure 2. Results from the light technical calculations for the industrial premises

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Voltage parameters

Harmonic	Yu, V	Yu, %			
			P =	0,568	kW
			S =	0,585	kVA
			cos ϕ =	0,969	
			PF =	0,917	
			Q =	-0,017	kVAr
1	224,2	100			
3	1,1	0,5			
5	3,8	1,7			
7	0,5	0,2			
9	1,4	0,6			
11	0,4	0,2	THD U =	1,9	%
13	1	0,4	RMS =	224,1	V
15	0,8	0,4			
17	0,4	0,2			
19	0,2	0,1			

Measurement of the electrical parameters of the industrial premises

Current parameters

Harmonic	Y _I , A	Y _I , %			
1	2,77	100	THD I =	22,6	%
3	0,61	22,6	RMS =	2,75	A
5	0,21	7,5			
7	0,11	3,8			
9	0	0			
11	0	0			
13	0	0			
15	0	0			
17	0	0			
19	0	0			

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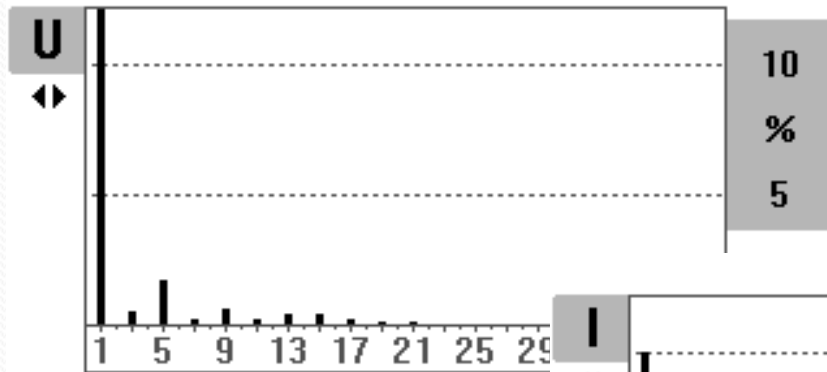


Figure 3.1. Generated Harmonic Voltage Pollution

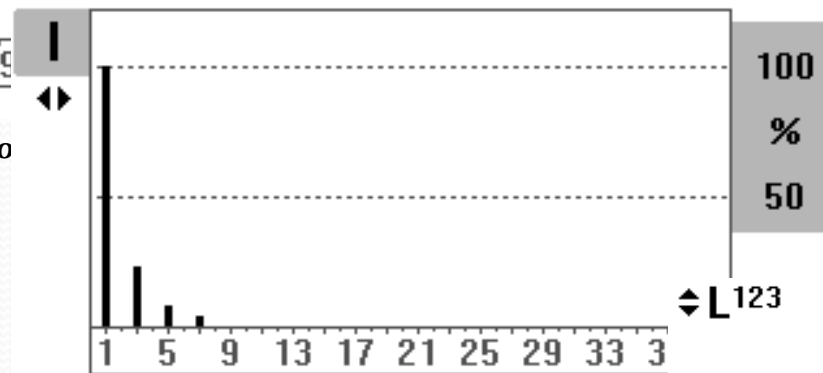


Figure 3.2. Generated Harmonic Current Pollution

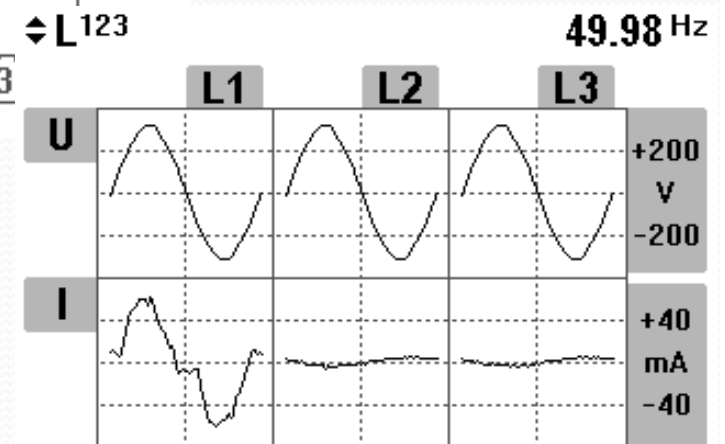


Figure 3.3. Form of the sinewave of the supply voltage and current 9

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Conclusion

- The electrical parameters of a small industrial lighting system were studied. LED industrial lighting luminaires of 60 watts are used.
- It was found that the main problem is the generated harmonic current pollutions (THD I = 22.6%), which is not very large, but with higher power of the system will affect the power supply network.
- It has been found that with the use of a quality power module, the electrical parameters of the lighting system are close to or corresponding to those required by the standard EN 61000.

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