



LIT UV WATER AND AIR DISINFECTION

LIT Group

UV Technologies



Piezo Engineering & Electronics



- ▶ Power tools
- ▶ Water treatment technology
- ▶ Health care products
- ▶ Consumer electronics



- ▶ 500 million euro turnover
- ▶ 1,400 employees

LIT UV FACILITIES



Scientific & Production Centre, Erfurt, Germany



Subsidiaries & Representative Offices



Erfurt, Germany



Eindhoven, the Netherlands



Budapest, Hungary



Sofia, Bulgaria



Moscow, Russia



Beijing, China



Lodz', Poland



Istanbul, Turkey

LIT UV established in 1991

We have around 170 active customers in 42 countries

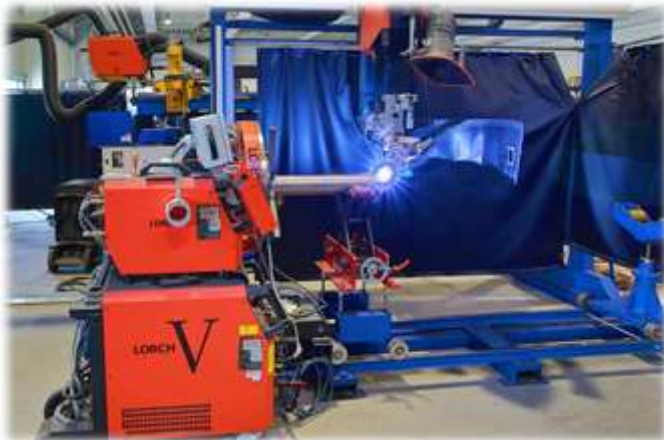
RESEARCH AND DEVELOPMENT



UV LIGHT SOURCES PRODUCTION



MECHANICAL PRODUCTION



ELECTRICAL PRODUCTION



- ▶ Certified to ISO 9001:2011
- ▶ 3 professors, 9 PhDs in various fields of UV related expertise
- ▶ Over 50 patents

UV TREATMENT PRODUCTS



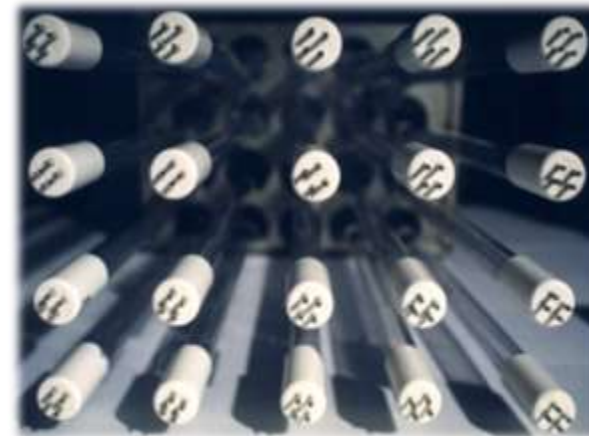
Pressurized UV Systems



Open Channel UV Systems



**Air And Surface
UV Disinfection Systems**



UV Lamp Technology

WATER UV DISINFECTION: MUNICIPAL APPLICATIONS



DRINKING WATER SUPPLY



WASTEWATER



WATER REUSE

WATER UV DISINFECTION: COMMERCIAL AND INDUSTRIAL APPLICATIONS



FOOD INDUSTRY



PHARMACEUTICAL INDUSTRY



FISH FARMS



SWIMMING POOLS

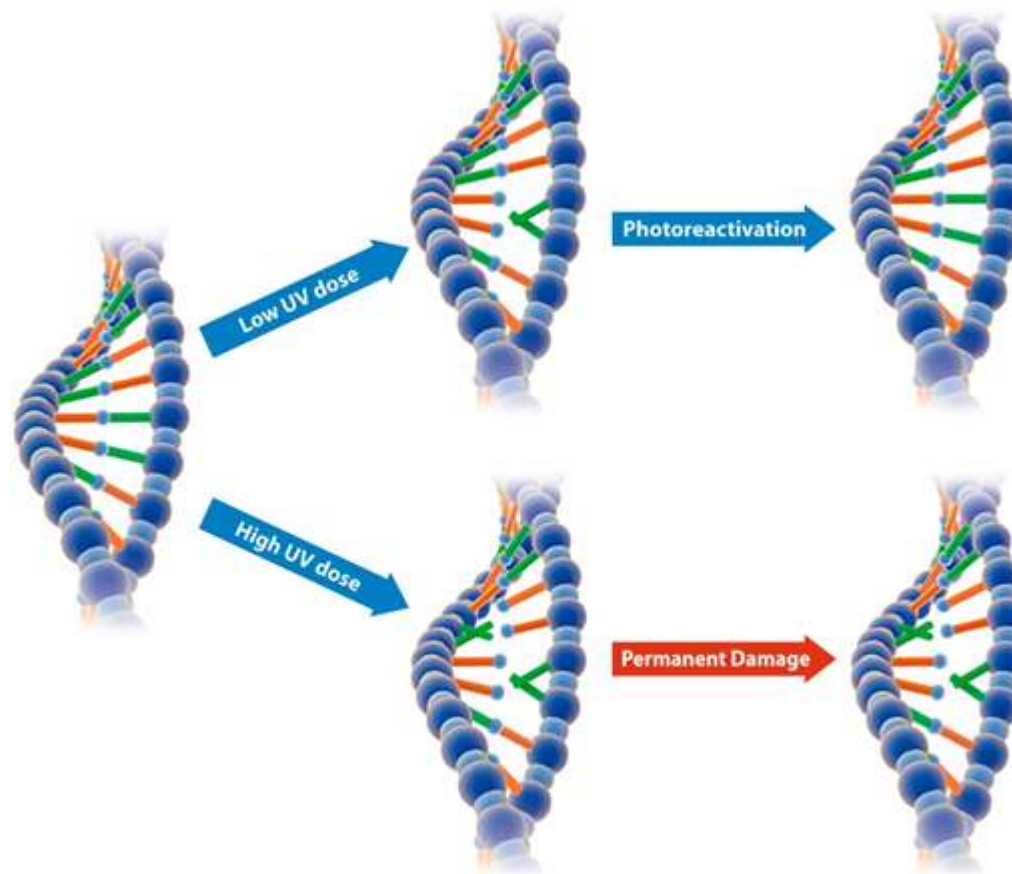
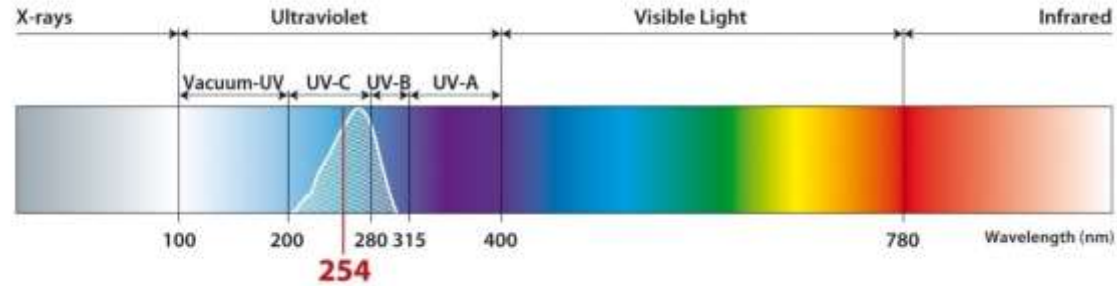


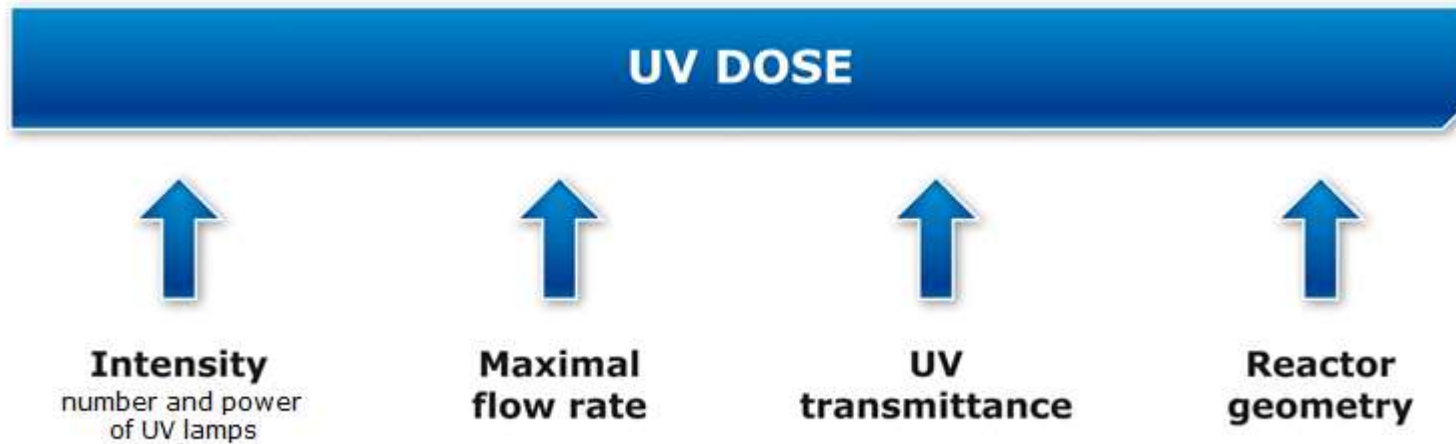
MICROELECTRONICS



OIL&GAS INDUSTRY

PRINCIPLE OF GERMICIDAL UV IRRADIATION





UV equipment to be designed to deliver minimal requested dose when all unfavorable factors coincide:

- ▶ maximal flow rate,
- ▶ minimal UV transmittance,
- ▶ sleeve fouling,
- ▶ end of UV lamp life.

BIO-ASSAY VALIDATION OF UV EQUIPMENT

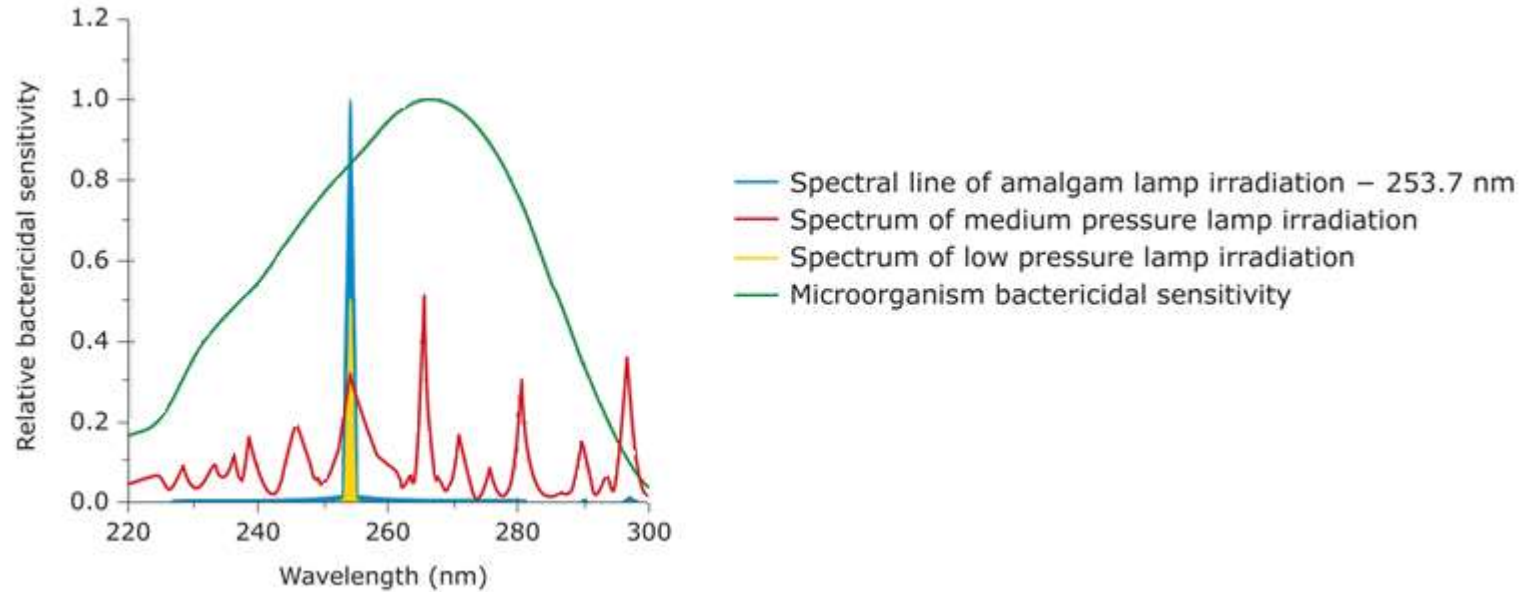


DELIVERED UV DOSE IS VALIDATED IN A BIO-ASSAY TEST



A wide range of LIT equipment is certified in accordance with :
ÖVGW, DVGW, SVGW and US-EPA,
the globally accepted Bio-Assay Validation Protocols for UV disinfection equipment

UV LAMP CHARACTERISTICS



PARAMETER	Medium pressure lamp	Mercury low pressure lamp	Amalgam low pressure lamp	Amalgam HO low pressure lamp
LAMP POWER	2,000 – 20,000 W	15 – 100 W	100 – 800 W	100 – 1,000 W
UV EFFICIENCY	≈ 10 – 12%	≈ 40%	≈ 40%	≈ 40%
LIFETIME, hours	Up to 8,000	Up to 16,000	Up to 16,000	Up to 16,000
BY-PRODUCT FORMATION	POSSIBLE	None	None	None

HO SERIES – NEW GENERATION OF LOW PRESSURE AMALGAM LAMPS

1. High efficiency

- ✓ UV lamp power up to 800 W for the conventional amalgam lamps
- ✓ UV lamp power up to 1000 W for HO series
- ✓ Efficiency up to 40%

2. Only 254 nm irradiance

- ✓ No by-product formation

3. Low operation temperature of UV lamp

- ✓ Minimum sleeve fouling
- ✓ Rated life time is up to 16,000 h

4. Compactness

- ✓ HO lamp length is reduced by 25%
- ✓ More compact dimensions of UV equipment

5. Multi-component amalgams

6. Innovative coating



UV EQUIPMENT DESIGN CONCEPTS

CLOSED VESSEL UV SYSTEMS



DUV Group



DUV PRO Group

OPEN CHANNEL SYSTEMS



MLP Group



MLV Group

INITIAL DATA FOR UV EQUIPMENT SELECTION

- ▶ **Flow rate**
- ▶ **Water quality data:**
 - ✓ **UV transmittance (UVT)**
 - ✓ **Turbidity**
 - ✓ **Color**
 - ✓ **Total iron (Fe)**
 - ✓ **Suspended solids (SS)**
 - ✓ **Chemical oxidation demand (COD)**
- ▶ **Disinfection criteria**
 - ✓ **Target microorganism**
 - ✓ **Outlet concentration of target microorganism (required level)**
 - ✓ **Requested UV dose**

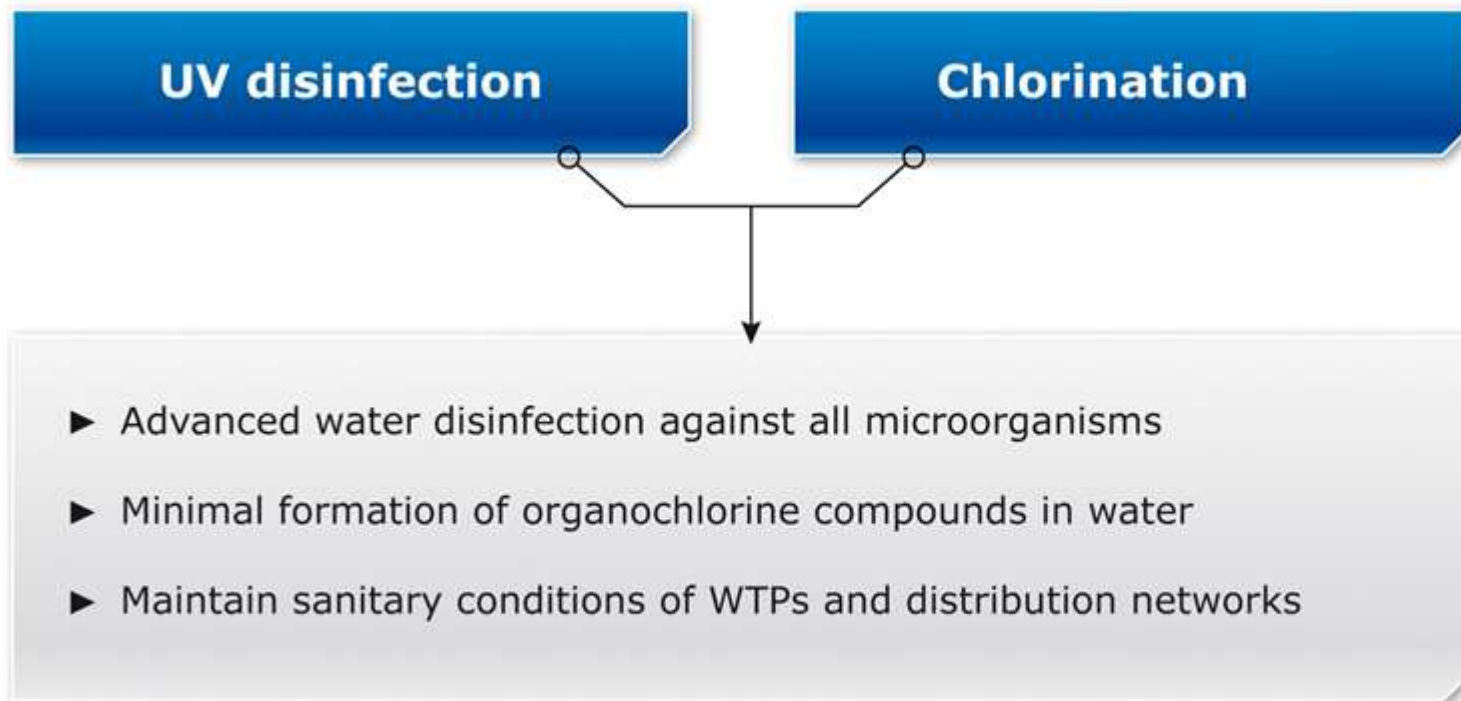


DRINKING WATER: VITAL TRENDS



- ▶ **UV disinfection is effective against chemical resistant viruses and protozoa**
- ▶ **Multi-barrier principle: combination of UV irradiation and chlorination enhances disinfection reliability**
- ▶ **UV disinfection usage reduces concentration of chlorine and chlorine compounds in the drinking water**
- ▶ **UV disinfection is applied in Budapest, Helsinki, Stockholm, Rotterdam, Amsterdam, Boston, San Francisco and others**

UV DISINFECTION & CHLORINATION



DRINKING WATER: DISINFECTION METHOD COMPARISON

Disinfection method	Advantages	Disadvantages
Chlorine gas Cl_2	<ul style="list-style-type: none"> • Effective against bacteria • Medium long term effect • Low operation cost 	<ul style="list-style-type: none"> • Ineffective against protozoa • By-product formation (THM) • Water quality dependence • Environment and explosion hazard
Hypochlorite NaClO	<ul style="list-style-type: none"> • Effective against bacteria • Medium long term effect • Low operation cost 	<ul style="list-style-type: none"> • Ineffective against protozoa • By-product formation (THM) • Water quality dependence
Chloramines NH_2Cl , NHCl_2 , NCl_3	<ul style="list-style-type: none"> • High long term effect • No by-product formation • Effective against biofilms • Relative low operation cost 	<ul style="list-style-type: none"> • Ineffective against bacteria and protozoa • Water quality dependence
Ozone	<ul style="list-style-type: none"> • Effective against bacteria and protozoa • Increase water quality 	<ul style="list-style-type: none"> • High capital and operation costs • No long term effect • By-product formation • Additional AC filters
Ultraviolet	<ul style="list-style-type: none"> • Effective against bacteria and protozoa • No by-product formation • Medium operation cost • Environment friendly 	<ul style="list-style-type: none"> • No long term effect

DRINKING WATER: UV EQUIPMENT

DUV-E Group



DUV-E – UV equipment for water with high UV transmittance ($75\% \leq \tau \leq 95\%$)



DUV Pro-E - UV equipment for water with high UV transmittance ($70\% \leq \tau \leq 98\%$)



DUV-A – UV equipment for water with ultra high UV transmittance ($\tau \geq 85\%$)

DUV PRO-E Group



DRINKING WATER: UV DISINFECTION PLANTS GROUND WATER



Erd, Hungary - 48,000 m³/day



Calarasi, Romania - 36,000 m³/day



Podolsk, Russia - 63,200 m³/day



Les Maquettes, France - 26,000 m³/day

EU'S LARGEST UV DISINFECTION SYSTEM IN BUDAPEST, HUNGARY (INFRARED WATER OF THE DANUBE RIVER)



UV disinfection was introduced in 2008–2010 based on favorable results of long term pilot tests

Total capacity of the UV plant consisting of 5 UV unit amounts to 600,000 m³/day

The main objectives are to increase disinfection efficiency first of all against chlorine resistant microorganisms and to reduce concentration of chlorine and chlorine compounds

WORLD'S LARGEST UV DISINFECTION SYSTEM IN ST. PETERSBURG (WATER SOURCE: THE NEVA RIVER)



North WTP 1,584,000 m³/day



Moskovskaya Pump Station 1,044,000 m³/day

North WTP	1,584,000 m ³ /day
Moskovskaya Pump Station	1,044,000 m ³ /day
Main WTP	864,000 m ³ /day
Murinskaya Pump Station	432,000 m ³ /day
Volkovskaya WTP	390,000 m ³ /day
Kolpinskaya WTP	250,000 m ³ /day
Frunzenskaya Pump Station	168,000 m ³ /day
South WTP	273,600 m ³ /day
Kronschtadt WTP	43,200 m ³ /day

**In 2004 Hepatitis A rate reduced from
124 to 3.3 per 100,000 persons (according
to Ministry of Health Report)**

UV TECHNOLOGY FOR WASTEWATER DISINFECTION

**Chlorination
+
dechlorination**

cost more
than

UV

Advantages:

- ▶ **Environmentally friendly**
- ▶ **Cost-efficient**
- ▶ **Safe**



Present-day sanitary and environmental requirements turned ultraviolet into the most economic technology for disinfection of treated effluents.

WASTEWATER DISINFECTION TECHNOLOGIES

Disinfection method	Advantages	Disadvantages
Chlorine	<ul style="list-style-type: none">• Effective disinfection• Low operation costs	<ul style="list-style-type: none">• Long term effect• Cancerogenic by-product formation• Environment hazard• Needs contact time• Complicated water treatment
Chlorine + dechlorination	<ul style="list-style-type: none">• Effective disinfection• Medium operation costs	<ul style="list-style-type: none">• Cancerogenic by-product formation• Needs double contact time• High capital costs
Ozone	<ul style="list-style-type: none">• Effective disinfection• No long term effect	<ul style="list-style-type: none">• High by-product formation• Environment hazard• High capital and operation costs
Ultraviolet	<ul style="list-style-type: none">• Effective disinfection• No by-product formation• Environment friendly• Medium operation costs	

UV EQUIPMENT FOR WASTE WATER

CLOSED VESSEL UV SYSTEMS

DUV-K Group



DUV-K – UV equipment for water with UV transmittance $30\% \leq \tau \leq 65\%$

DUV Pro-K - UV equipment for water with UV transmittance $30\% \leq \tau \leq 65\%$

MLP-G – UV equipment for water with UV transmittance $\tau \geq 50\%$

MLP-F – UV equipment for water with UV transmittance $\tau \leq 50\%$

MLV-G– UV equipment for water with UV transmittance $\tau \geq 50\%$

MLV-F Series – UV equipment for water with UV transmittance $\tau \leq 50\%$

DUV PRO-K Group



OPEN CHANNEL SYSTEMS

MLP Group



MLV Group



WASTE WATER: CLOSED UV SYSTEMS



**WWTP, Orange,
France - 36,000 m³/day**



**WWTP, De-Friz ,
Vladivostok, Russia - 18,000 m³/day**



**WWTP, Sesimbra,
Portugal - 6,400 m³/day**



WWTP, Port Fairy, Australia - 6,100 m³/day

WASTE WATER: OPEN CHANNEL UV SYSTEMS



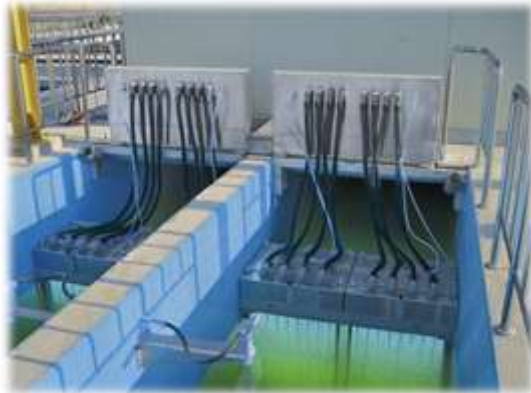
**WWTP, Gumi,
South Korea - 330,000 m³/day**



**South-West WWTP, St. Petersburg
Russia - 330,000 m³/day**



**WWTP, Suzhou,
China - 260,000 m³/day**



**WWTP, Jeonju,
South Korea - 120,000 m³/day**



**WWTP, Pecs,
Hungary - 86,400 m³/day**



**WWTP, Beijing
China - 60,000 m³/day**

WASTE WATER: OPEN CHANNEL UV SYSTEMS



**WWTP, Gadong,
Brunei -58,200 m³/day**



**WWTP, Tatabanya,
Hungary - 24,000 m³/day**



**WWTP, Lovech,
Bulgaria -20,400 m³/day**



**WWTP, Cannet,
France -18 700 m³/day**



**South WWTP,
Budapest, Hungary - 80,000 m³/day**



**WWTP, Chateaulin,
France - 8,400 m³/day**

LARGE SCALED UV SYSTEM AT HUAI FANG – 600 000 m³ /day



Parameter	Unit	Value
Average daily flow rate	m ³ /day	600 000
Maximum hourly flow rate	m ³ /hr	32 500
Total power consumption	kW	380
Number of channels	pcs	6
Total number of lamps	pcs	432

WORLD'S LARGEST UV SYSTEM AT THE KURYANOVO WWTP 3,125,000 m³/day



Parameter	Unit	Value
Average daily flow rate	m ³ /day	3,125,000
Maximum hourly flow rate	m ³ /hr	180,000
Total power consumption	kW	3,800
Number of channels	pcs	17
Total number of lamps	pcs	6,120

PROCESS WATER:DUV-N GROUP



MASTER



ADVANCED



BASIC

Power Consumption, W

Up to 3700

Up to 730

Up to 340

UV Sensor

ÖNORM

Yes

None

Cleaning Systems

Chemical cleaning system;
Optional mechanical cleaning system

Optional

None

SCADA integration

Yes

None

None

DUV-N PHARMA GROUP



- ▶ All-equipped units available in MASTER Plus and ADVANCED configurations
- ▶ UV reactor made of stainless steel 316Ti
- ▶ High grade material polish of the UV reactors inner surface (Ra 0,4–0,8 micron)
- ▶ Sanitary fittings or tri-clamp water connections
- ▶ Clamp-connection seal materials: silicone, NBR, EPDM, Viton or PTFE.
- ▶ 254 nm selective UV sensor certified according to ÖNORM
- ▶ MASTER Plus units equipped with easy-to-use touch screen which indicates system failure, lamp elapsed time, UV intensity and transmittance, data from flow meter and calculated UV dose.
- ▶ Control cabinet made of stainless steel, IP65
- ▶ Remote control that can be easily integrated into SCADA

UV SYSTEMS FOR INDUSTRIAL AND COMMERCIAL APPLICATIONS



**Food factory, Netherlands,
6 000 m³/day**



**Pharmaceutical factory, Bulgaria,
1 400 m³/day**



**Municipal WWTP, Portugal,
480 m³/day**



**Public swimming pool, Hungary,
2 400 m³/day**



**Fish Farm, Norway,
1 030 m³/day**

UV SYSTEMS FOR INDUSTRIAL AND COMMERCIAL APPLICATIONS



Swimming pool, Czech Republic
500 m³/day



Irrigation, Spain
20,000 m³/day



Drinking water, Poland
16,800m³/day



Drinking water, Russia
3,500 m³/day



Drinking water, Cambodia
9,500 m³/day

THANK YOU!

email: info@lit-uv.com

www.lit-uv.com