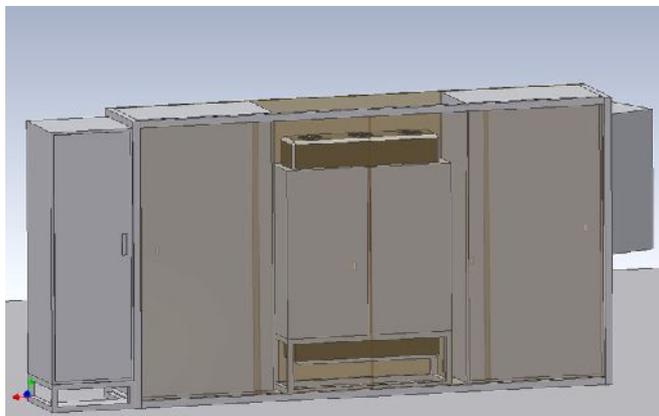
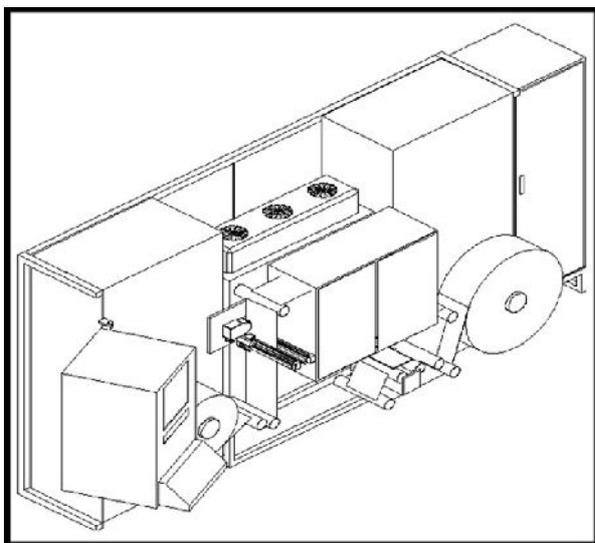


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PS-250-4 quad bobbin perforation machine



Pos. 1 - Perforation system PS-250-4

- **double web path system – perforation section A+B+C – cascaded in web direction**
- each perforation section unit A, B and C with 8 electrode sets
- electrostatic double web path perforation of 4 bobbin width and 8 perforation zones in total
- **slim-roll-by-roll production up to 24,300 meters**
- **4 bobbins on each cut, up to 8 cuts with 32 bobbins on one slim roll without interruption**
- **option:** quad bobbin by bobbin set production: the rewind stand can be performed with a slitting and flying splice unit, two driven rewind shafts and zero meter start, slim rolls at unwind stand
- total web width up to 280 mm by 4 bobbins each of 64 mm width
- in total 3*8 = 24 single perforation channels
- electrode housing: approx. 1,800mm wide, approx. 1,000mm high, approx. 600mm depth
- web inlet = below right, web outlet = top left
- on-line porosity control OPSS-1 scanner device just behind web outlet
- OPSS-1 scanner: approx. 320 mm wide, approx. 350 mm high, approx. 450 mm, all over dimension
- Rittal electronic cabinet: 600*600*2,000 mm for 24 perforation channels
- Rittal high voltage transformer box for 24 perforation channels: 1,200*800*400 mm – assembled at rear side of the perforation unit
- machine/perforation control: 1,200*600*600mm, positioned as swing over panel at rewind section
- manual/automatic pulse width control 12 - 22 micro second for each perforation channel, electrode sets, coupled in eight groups of A, B, C together
- common frequency control for all perforation channels: 1,000 up to 6,000 Hz
- hole size diameters can be influenced by variation of pulse length in ranges from 25-80 microns
- hole densities/distances down web can be influenced by variation of spark repeat frequency
- hole density control – between 80 up to 200 h/cm²

- perforation control of electronic cabinet from machine control unit
- **option:** automatic porosity feed-back and trend control with OPSS-1 porosity scanner unit
- power consumption of perforation unit: 3*400V/50/60Hz, approx. 12 KVA
- protection class and EU conformity: IP55, CE, EN2004/108/EC, NEC, CCC
- operation range: 15 up to 35°C
- noise level: < 83 db(A)
- standard color: gray RAL 7032 – or others
- machine dimension: 5,500mm length, 1,900mm depth, 2,100mm high; depends of performance
- approx. machine weight: 3,400 Kg; depends of technical performance

Pos. 2 – Perforation section

- perforation housing: 1,800*1,000*600mm, three shielded windows in the front easy lift up door, noise reduced, internal EMI shielded
- base steel plate with 12 leading bars for 24 electrode sets
- 26 pieces AL chemical black coated, dust protected, smooth surface, light running web leading rollers in 80 mm diameter
- three sections of perforation electrodes sets, each equipped with 10 pieces of 1.0 mm Tungsten pins
- electrode gap: 1.5 up to 1.6 mm - maximal
- open/close electrode gap mechanism, one side pneumatic sliding cylinders, fixed opposite side with high voltage connection cables
- high voltage cable connectors fields embedded at rear machine base plate, high voltage transformer box added behind
- zone positioning manual/semi automatic with electrode bracket setting, pre-alignment, rough and fine adjustment across the web and with angle positioning
- electrode pin reset with slid-in plates, pneumatic open/close gaps, efficient pin resets in 5 minutes of three perforation sections
- time interval of electrode pin resets: 8-24 operating hours - depending of perforation power loading
- life time of 1.0*80 mm Tungsten electrode pins: approx 2,500 operating hours
- electrode air cooling by two side-channel-compressors, each of 400 m³/h, 70 mbar air pressure
- plastic air pipe system, equipped with all hose connectors for 24 electrode sets
- bottom air film in blowing between double web path and absorption on the top with two vacuum devices to avoid inner paper web touches
- one side channel compressor of 140 m³/h with 40 mbar for air film in-blowing
- dust air cleaning device at web outlet
- three inner, two outer dust extraction connectors: approx. 1,500 m³/h by minimum of -10 mbar
- **note:** the dust extraction system and outside pipes are not combines by the PS-250-4 delivery

Pos. 3 - rewinding machine

Machine unwind/rewind stands

- tipping paper material with a weight of 32-36 g/m²
- web width up to 300 mm
- web speed up to 600 m/min
- web tension controlled: 30 up to 200 N
- inner core diameter: 120mm on both sides, optional 66 or 70 mm
- slim roll lengths up to 25,000 meters
- slim roll weight maximal 300 Kg by 25,000 m
- slim roll diameter maximal 900mm by 25,000 m
- acceleration time approx. 3 second up to 400 m/min
- web guide unit and movement (E&L, Five, BST, FMS) maximal 10 mm, web leading constancy of +/- 0.1mm, positioned at unwind section
- 80 mm light running AL idle rollers, chemical black, dust protected, smooth surface

Shaft-less unwind stand

- Designed to handle 300 kg slim rolls with AC drive
- the stand is constructed with a solid steel base plate to give the best rigidity
- the machine is complete with a shaft-less unwind stand to handle 900mm diameters down to a minimum of 70mm
- the stand is complete with 120mm (or other options) pneumatically operated concentrically

- expanding quick able chucks suitable for insertion into the cores
- linear slides for precision guiding which would be signaled via the lead screw and driven by fast response servo motor and drive for full guider movement of a maximum of 10mm
- unwind tension control via PLC algorithms, AC drive and operators set reference
- operators controls, guider controls, unwind stand control are all positioned on the central control panel at rewind section
- the stand can be fitted with a splice table (optional) when specified

Shaft-less rewind

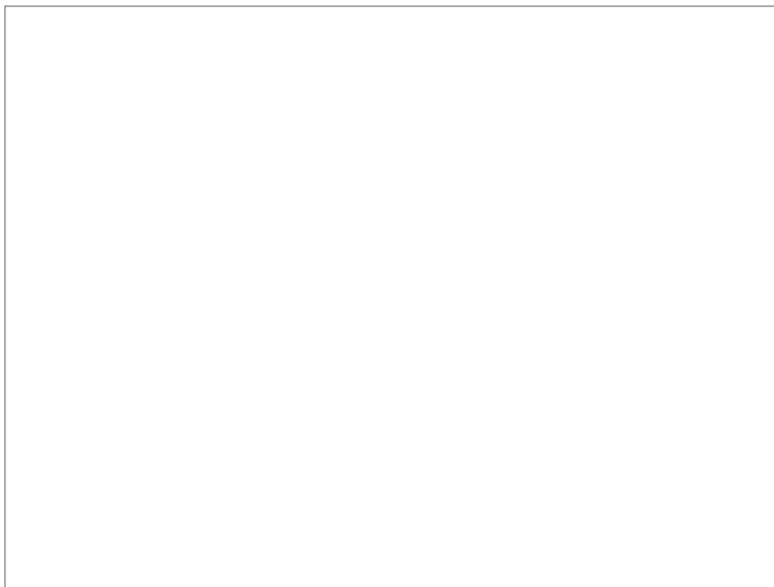
- Designed to handle 300 kg slim rolls with AC drive
- the stand is constructed with a solid steel base plate to give the best rigidity
- the machine is complete with a shaft-less unwind stand to handle 70mm diameters up to a maximum of 900mm
- the stand is complete with 120mm (or other options) pneumatically operated concentrically expanding quick able chucks suitable for insertion into the cores
- rewind tension control from AC motor, digital flux vector drive signaled via PLC algorithms, operators set reference and encoder feedback
- pneumatically force controlled width lay-on roller is provided
- web fix guider before rewind shaft
- operators controls, guider controls, rewind stand control are all positioned on the central control panel at rewind section
- **option:** quad bobbin by bobbin set production: the rewind stand can performed with a slitting and flying splice unit, two driven rewind shafts and zero meter start, slim rolls at unwind stand

Machine and process control, electronics, interfaces

- Allen Bradley or Siemens S7 PLC, common 17" touch screen for machine, perforation, porosity vision control with OPSS-1 system
- fully process visualization, error history/message board, interlock and machine sensor indications
- AC drive configuration, parameter setting and reports
- OPSS-1 parameter setting, porosity vision trend setting, further information see position 5
- test routines, help/support routines, Internet service support
- Electronics and pneumatic into two added cabinets on the unwind and rewind section
- power consumption of the rewinding unit: 3*400V/50/60Hz, approx. 11 KVA
- system air supply and consumption: 6 bar max. 0.1 m3/h
- protection class and EU conformity: IP55, CE
- operation range: from 15 up to 35 Grad/C
- noise level: <83 db(A)
- standard color: gray RAL 7032 or other color

Pos. 4 - Production results at Tipping paper

- electrostatic zone perforation
- paper weight: 32 up to 36 g/m²
- standard bobbin widths: 48mm, 64mm or others
- tipping paper width up to four bobbins: 280mm
- perforation zone width: 2.0 up to 6.0mm
- perforation zone position constancy: +/- 0.2mm
- zone register : centre-centre zone : minimal 22.0mm (Z/2) – 48mm
centre-zone edge : minimal 12.0mm (Z/2) – 48mm
- holes density: 50 up to 280 holes/cm²
- hole sizes: 25 up to 80 micron
- hole sequence: 3.0 up to 7.0 Million per second
- **porosity range: from 100 C.U. up to 800 C.U.**
- **maximum perforation power coefficient, 3 units of double web path, zone width 4.0mm**
120,000 (C.U.*m/min) ----- example 240 C.U. = 500 m/min, 500 C.U. = 240 m/min
- porosity deviation cv: with OPSS-1 < 3.0 % by 300 C.U., depends on paper quality



Pos. 5 – OPSS-1 porosity scanning, porosity sensor measurement, feed-back system

General data

- Laser perforation rows or groups or ESP porosity of tipping, plug-wrap or cigarette paper
- multiple sensor systems: line laser and monochromatic light source
- sensor A = perforation rows/groups or ESP zone position control
- sensor B = porosity control – simultaneously – see below details
- transmitter case with Line Laser + monochromatic light source on one side
- measuring head gap between transmitter and sensor case: 3.0mm
- dimension of each sensor device: length 160mm; width 100mm; deep 60mm = across the web
- sensor device: AL chemical black; dust free; protection class IP 65
- mechanic connected to the scanner system: with flange plates
- geometric center distance of both optical axis A and B: 26mm = across the web

- porosity detection - B - with simultaneously compensation of printing design, thickness, structure, lines, text contours, pinholes, surface roughness etc.
- automatic light intensity setting for different porosities, auto range function and routine
- laser line A: integrated at transmitter case - 20.0*0.15mm; 635 nm, 10 mW, Class 2
- light source B: light cassette with front fiber connector; stabilized Halogen light source 12V/100W; 550 up to 650 nm; internal lamp power supply; remote controlled by AT-Mega-128-16AI sensor controller; long-life lamp operation up to 1,500 hours; high flexible industry proof optical glass fiber
- position sensor A: real-time 64 pixel CCD-Sensor, internal control logic device
- porosity sensor B: real-time multiple color/intensity sensor system, AT-Mega-128-16AI
- sensor output A+B: pre-signal conditioning by AT-Mega-128-16AI controller Firmware
- communication via ASCII-commands, fast RS-232 link up to 256 KBaud or RS-422
- 19" rack equipment: 230V/AC/250VA/50Hz; sensor power supply 24V/2A - 5V/1A; light cassette, interfacing and RS-232 link connectors
- CE electrical conformity of the OPSS-1 system
- absolute position control via ASM magnet resistive position Sensor system in lengths from 300 up to 2,000mm; base resolution of +/- 30 micron; direct connected to sensor controller
- cleaning device and positioned air blowing nozzle

Porosity data

- total porosity measuring range: 80 up to 3,000 C.U.
- range A: 80 - 200 C.U. maximal +/- 4 C.U.
- range B: 201 - 600 C.U. Maximal +/- 6 C.U.
- range C: 601 - 3,000 C.U. maximal +/- 20 C.U.
- optical integration of measuring window of Sensor B: approx. 12mm
- possible ESP perforation zone detection: 1.0-8.0mm
- possible Laser perforation rows/groups: from 1 up to 8 single lines for each porosity detection and control by maximal 8 mm group width
- minimum distances between Laser lines or perforation zones: 1.0mm
- scanning speed: from 20 up to 200mm/second

Sensor controller, position porosity detection

- OPSS-1 Firmware 0.12 - up/down loading via high-speed RS-232, RS 485, RS-422, Ethernet, USB
- RS-232 fast link up to 256 KBaud, optional via RS-422 bi-directional link
- Sensor firmware source code: Pascal program language
- measuring data exchanging between Master-PC and OPSS-1-Sensor system: commands send to the Sensor; receive data, setting/storage/reading parameters in order of the command list
- porosity calculation: four envelope curves; their integral values, different mathematical formulas, data calculation of porosity output in C.U., paper offset value, see the manual description
- additional procedure: porosity calibration; setting of Halogen lamp intensity; reference position, paper position edges etc. in order of commands and procedure list
- option: simultaneously acquisition and data output of each perforation zone/line position and their perforation quantity, as well for all optical porosity integrals via internal calculated envelope curves of multiple colors/ intensity, paper offset values – data exchanging to the Master PC- process software
- rough data Tool program: monitoring/display envelope curves, positioning line laser, etc.
- test possibilities: LAPTOP/PC; Hyper-Terminal without Master-PC process software

General data mechanical scanning system

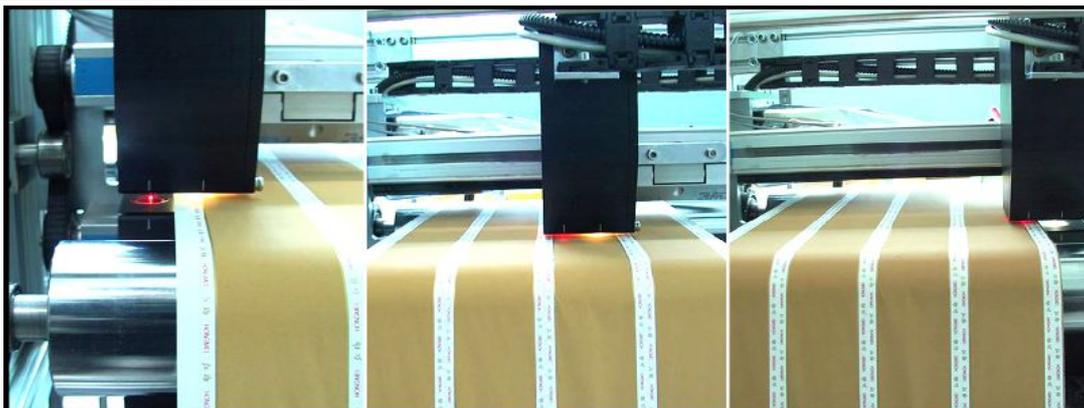
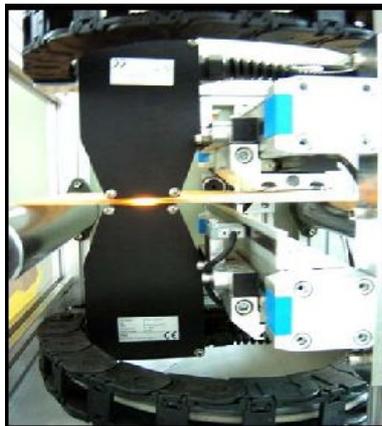
- paper working web width up to 300mm from 1 up to 4 bobbin sets
- twin mechanical tooth belt driven scanner axis with one stepping motor
- precisions spindle axis with internal reference switch and dust protected sliding bars
- stepping motor and control unit with half step operation – USB connected to master PC/PLC
- absolute position control via ASM magnet resistive position Sensor for the entire stroke length plus 15mm; base resolution of +/- 30 micron; direct connected to the sensor controller
- system performance, details, dimensions in order of base drawings
- fully assembled, integrated in a ultra stable AL-frame – see drawings
- OPSS-1 system positioned just after perforation section and web out coming
- base frame with two 80mm AL light running idle rollers for stable and precise web leading
- geometrical alignment of the scanner device: +/- 0.1mm in all dimensions of X,Y and Z axis
- sensor measuring gap cleaning unit, positioned close to the first inner reference point

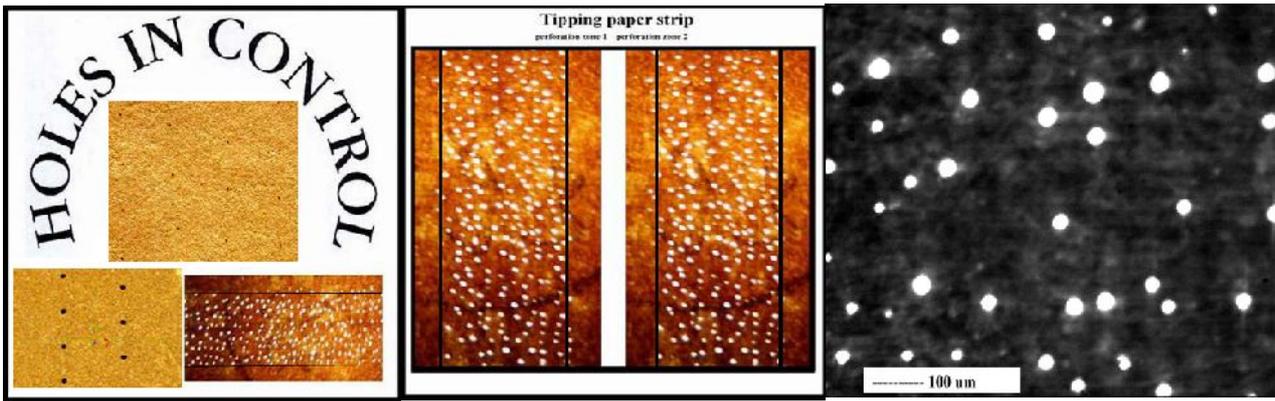
PC control system and cabinet

- 19" electronic performance integrated into the swinging operation panel at rewind section
- scanning controller, power supplies, master PC, 17" TFT touch screen, keyboard, machine interface
- industry PC 2.4GHz duo core, 200GB HD, 2048MB, CD-R/W-ROM, USB, etc.
- two process programs: OPSS-1 Master process software, OPSS-1 Sensor Real-Time Firmware
- master PC with MS-Windows XP Professional or Beckhoff TwinCAD real time operation system
- **alternative:** Allen/Bradley or Siemens S7 master operation
- process visual for all perforation channels and graphic recordings
- base program language: C++, Visual Basic or object orientated PLC
- network with production control center/quality management – depends of the local application field

Multiple real time process software for porosity control

- real time recording, statistic calculations of positions, quality changes of each ESP zones – Sensor A
- real time porosity recording, statistic calculations of each perforation zone in C.U., cv in %, warning levels and alarm limits during production – Sensor B
- real time records of paper offset at non-printed gaps by each scanning turn
- statistic summary of each production roll/bobbin: date-time, job number, roll number, production length, channel or Laser line group numbers, porosity results in C.U., cv, warnings, alarms, positions
- ESP perforation zone or Laser line group qualities, quantities
- number of porosity values from each perforation zone: up to 5,000 single values by 20,000 meters
- e.g. by web speed of 200 m/min up to 200,000 values for one production roll with 40 perforation channels, 20 bobbin sets, by 50 up to 200 mm/sec. scanning speed
- real time process visualization of ESP zone position, widths, continuous quality control
- real time ESP single zone operation, multiple zone, full process visualization during production
- easy calibration and feedback control to the ESP (OPSS-1 controller system) perforation system
- **option:** network or manual inputs of static porosity values (Borgwaldt or Filtrona) according to each perforation zones to keep the OPSS-1 measurement levels precise and drift free to the static
- single bobbin and roll data storage, up to 500 rolls or 5,000 bobbins, statistical results of each bobbin, bobbin cuts, each roll, group of rolls, roll certification in terms of ISO 9001/9002
- **option:** network/data transfer to the quality control center QC
- **option:** Hard, Software modules for automatic porosity vision control of IPM PS-250-2, PS-250-4, PS-1000, PS-1200, PS-1600, PS-2000 perforation or Laser perforation machines
- program language: English, Mandarin or German





Pos. 6 – production output of tipping paper

- web width up to 4*50mm bobbins, 24 perforation channels – 3 times cascaded
- perforation power with triple section and double web path on each - zone width of 4.0mm
- **perforation power coefficient 110,000 C.U.*m/min**
- **porosity deviation cv – with OPSS-1 < 3.0 % by 300 C.U. - depends on paper quality**
- **porosity deviation cv – without OPSS-1 < 4.0 % by 300 C.U. - depends on paper quality**

annual production output PS-250 quad bobbin electrostatic perforation machine

- slim roll length 15,100 meters, 4 bobbins width, each bobbin 50 mm width
- 6 kg weight of each bobbin - 4 mm zone width – power coefficient 110,000 (C.U.*m/min)
- online slitting of quad bobbin sets at rewind stand
- slim roll exchanging time in 12 minutes – one machine operator
- production efficiency approx. 90 % - breaks, cleaning, shift changing, etc.
- three shift operation – 260 operation days per year

example A: 150 C.U. – web speed 600 m/min – maximum speed

- each bobbin running time: $3000\text{m} / 600\text{m/min} = 5$ minutes
- 15,100 meters / 3000 meters = $5 \times 4 = 20$ bobbins
- slim roll running time: $15,000 / 600 \text{ m/min} = 25$ minutes = 20 bobbins
- shift output: $((480 \text{ min} \times 0.9) / (25 \text{ min} + 12 \text{ min})) \times 20 \text{ bobbins} = \underline{233 \text{ bobbins}}$
- daily output by 3 shifts: $3 \times 288 \text{ bobbins} = \underline{699 \text{ bobbins}}$
- **output by 260 working days/a: $260 \times 699 \text{ bobbins} = \underline{181,700 \text{ bobbins/a}}$**
- annual amount: $181,700 \text{ bobbins} \times 6 \text{ Kg/bobbin} = \underline{1,090 \text{ tons/a}}$
- scarp paper by 100 meters start-up and stop for each slim roll of 15,000 meters
- sum of scarp length $((181,700 \text{ bobbins/a} / 20 \text{ bobbins}) \times 100 \text{ meters}) = 908,000 \text{ meters/a}$
- **scrap tipping paper rate $((908,000 \text{ meters/a} / (3000 \text{ meters/b})) \times 6 \text{ kg} = \underline{1.8 \text{ t/a}}$**

example B: 250 C.U. – web speed 440 m/min

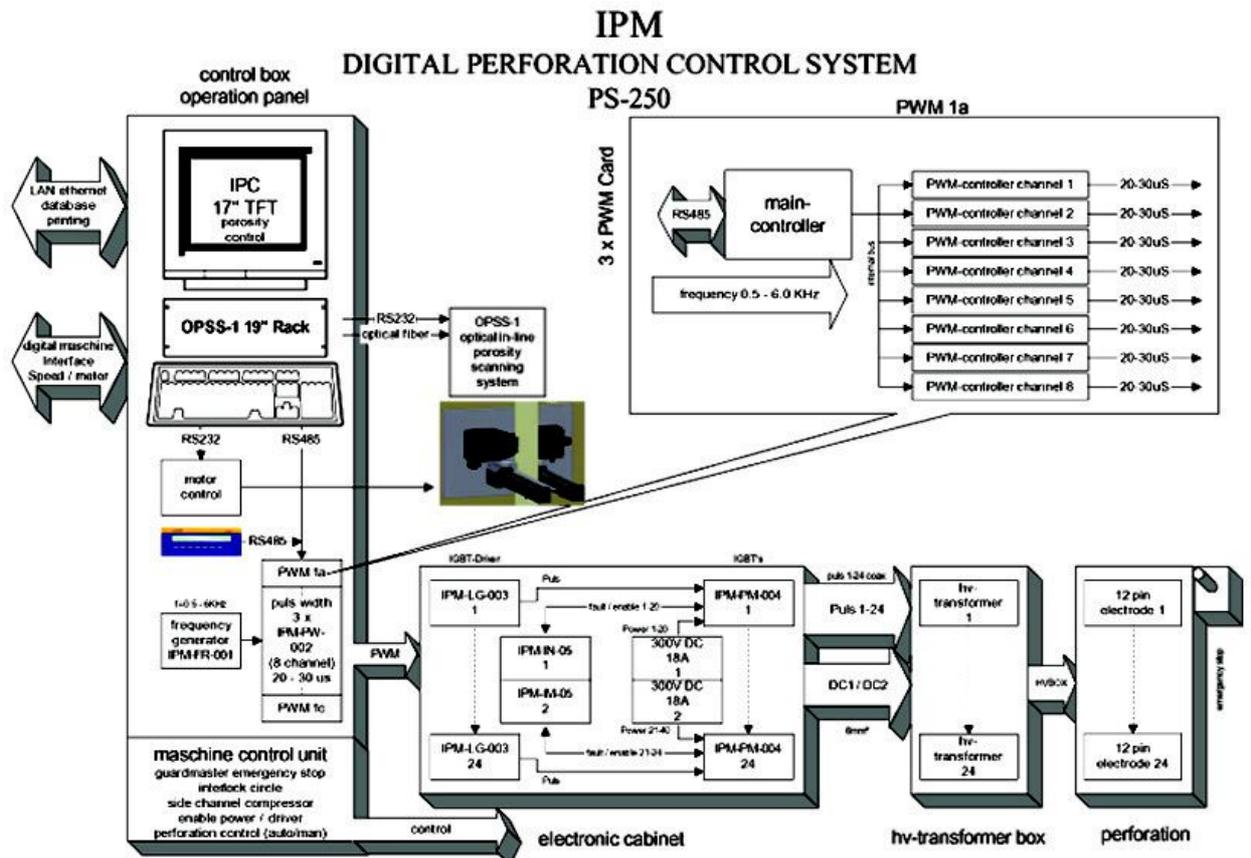
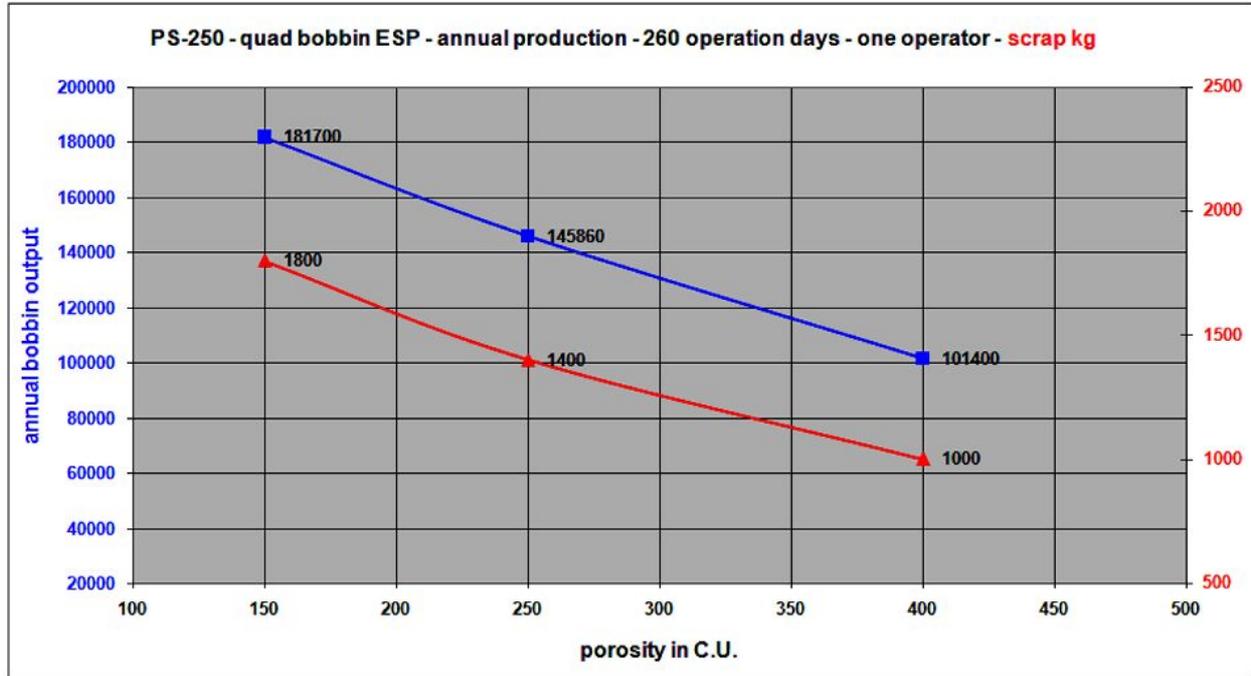
- each bobbin running time: $3000\text{m} / 440\text{m/min} = 6.8$ minutes
- 15,100 meters / 3000 meters = $5 \times 4 = 20$ bobbins
- slim roll running time: $15,000 / 440 \text{ m/min} = 34$ minutes = 20 bobbins
- shift output: $((480 \text{ min} \times 0.9) / (34 \text{ min} + 12 \text{ min})) \times 20 \text{ bobbins} = \underline{187 \text{ bobbins}}$
- daily output by 3 shifts: $3 \times 187 \text{ bobbins} = \underline{561 \text{ bobbins}}$
- **output by 260 working days/a: $260 \times 561 \text{ bobbins} = \underline{145,860 \text{ bobbins/a}}$**
- annual amount: $145,860 \text{ bobbins} \times 6 \text{ Kg/bobbin} = \underline{875 \text{ tons/a}}$
- scarp paper by 100 meters start-up and stop for each slim roll of 15,000 meters
- sum of scarp length $((145,860 \text{ bobbins/a} / 20 \text{ bobbins}) \times 100 \text{ meters}) = 729,000 \text{ meters/a}$
- **scrap tipping paper rate $((729,000 \text{ meters/a} / (3000 \text{ meters/b})) \times 6 \text{ kg} = \underline{1.4 \text{ t/a}}$**

example C: 400 C.U. – web speed 275 m/min

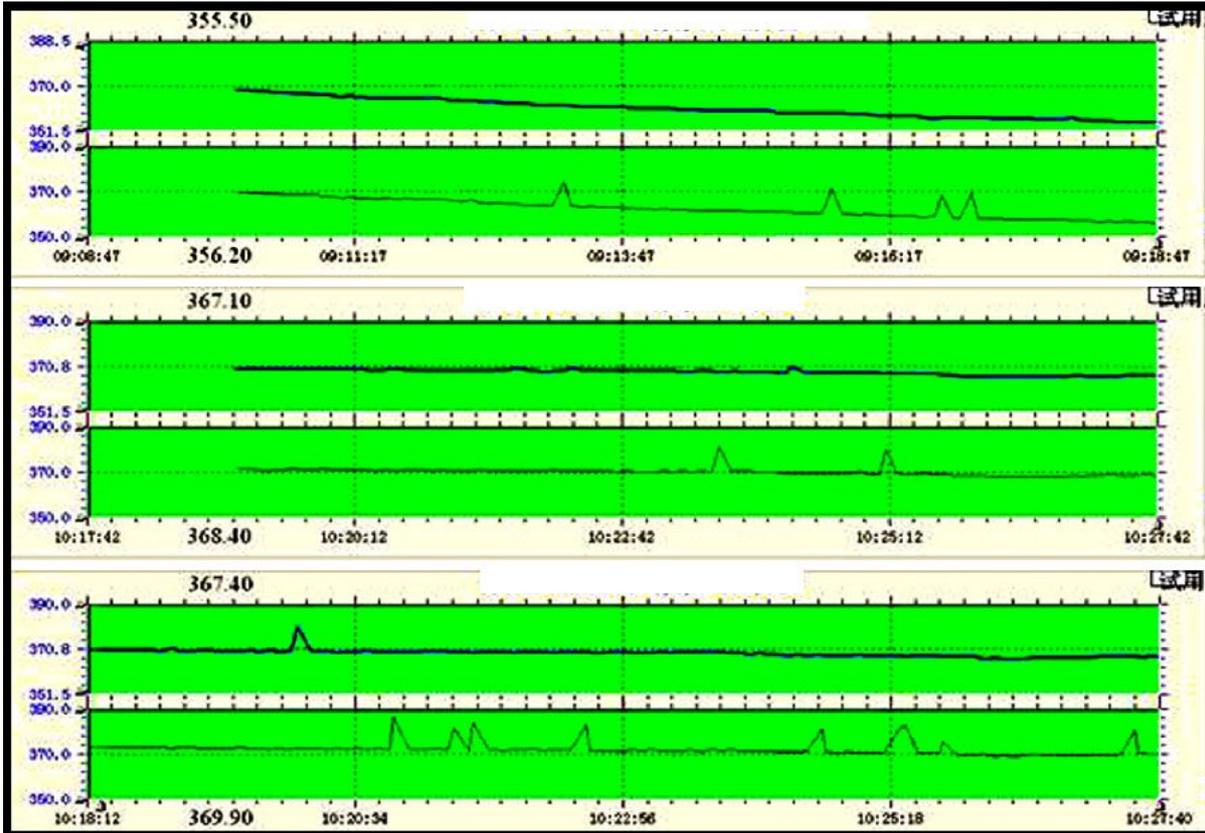
- each bobbin running time: $3000\text{m} / 275\text{m/min} = 10.9$ minutes
- 15,100 meters / 3000 meters = $5 \times 4 = 20$ bobbins
- slim roll running time: $15,000 / 275 \text{ m/min} = 54.5$ minutes = 20 bobbins
- shift output: $((480 \text{ min} \times 0.9) / (54.5 \text{ min} + 12 \text{ min})) \times 20 \text{ bobbins} = \underline{130 \text{ bobbins}}$
- daily output by 3 shifts: $3 \times 130 \text{ bobbins} = \underline{390 \text{ bobbins}}$

- output by 260 working days/a: 260×390 bobbins = 101,400 bobbins/a
- annual amount: 101,400 bobbins*6 Kg/bobbin = 608 tons/a
- scarp paper by 100 meters start-up and stop for each slim roll of 15,000 meters
- sum of scarp length ((101,400 bobbins/a / 20 bobbins) * 100 meters) = 507,000 meters/a
- scarp tipping paper rate ((507,000 meters/a / (3000 meters/b)) * 6 kg = 1.0 t/a

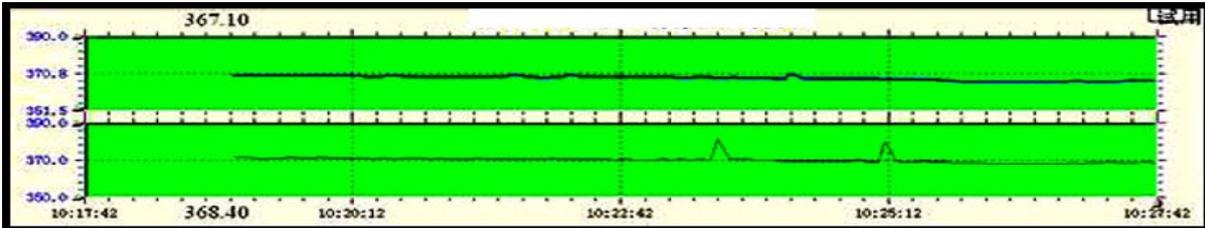
General Remarks: We reserve the right to incorporate changes and modifications of the equipment by which the performance and operation are not influenced.



without porosity vision control



with porosity vision control



参数设置
 用户管理
 数据报表
 系统管理
 联机启动
 脱机停止
 联机继续
 电机控制
 系统退出

```

READY
READY
ZERO OK
READY
SEARCH PPOS
PPOS1= 26.9mm
PPOS2=276.8mm
READY SEARCH ZONE
ZONE 1= 53.6/ 54.8mm
GAP = 64.8/ 68.1mm
ZONE 2= 77.9/ 79.0mm
GAP = 93.9/ 97.2mm
ZONE 3= 111.8/ 113.1mm
GAP = 123.0/ 126.3mm
ZONE 4= 136.2/ 137.4mm
GAP = 152.1/ 155.4mm
ZONE 5= 170.0/ 171.4mm
GAP = 181.2/ 184.5mm
ZONE 6= 194.4/ 195.8mm
GAP = 210.4/ 213.7mm
ZONE 7= 228.3/ 229.6mm
GAP = 238.5/ 242.8mm
ZONE 8= 252.6/ 254.0mm
ENDZONE
READY
READY
ZONE 1
RED= 46%
GREEN= 47%
BLUE= 72%
INTENS= 55%
LAMP= 70%
ZONE 2
RED= 43%
GREEN= 43%
BLUE= 67%
                
```

ZONE3= 348.5 CU

Command2: 6

Command3:

```

SEARCH ZONE
ZONE 1= 53.6/ 54.8mm
GAP = 64.8/ 68.1mm
ZONE 2= 77.9/ 79.0mm
GAP = 93.9/ 97.2mm
ZONE 3= 111.8/ 113.1mm
GAP = 123.0/ 126.3mm
ZONE 4= 136.2/ 137.4mm
GAP = 152.1/ 155.4mm
ZONE 5= 170.0/ 171.4mm
GAP = 181.2/ 184.5mm
ZONE 6= 194.4/ 195.8mm
GAP = 210.4/ 213.7mm
ZONE 7= 228.3/ 229.6mm
                
```

	1	2	3	4	5	6	7	8	
CU	349.9	347.9	348.1	380.	347.8	344.8	347.2	348.5	产品长度 (m): 0
CU									电机位置: 347847
W	1.2	1.1	1.3	1.2	1.4	1.4	1.3	1.4	CU参数: B PPOS1 26.9
SP	27.9	23.1	32.8	23.1	32.6	23	32.5	23	W参数: PPOS2 276.8

production results - ESP perforated tipping paper, 3.0 mm zone width, nominal porosity 200 C.U.

Zone No. Scanning Turns	zone 1	zone 2	zone 3	zone 4	zone 5	zone 6	zone 7	zone 8
1	220,2	194,2	216,2	200,5	206,4	194,6	186	215,1
	218	182,3	215,5	198,1	204,9	191,8	185	213,6
2	215,5	180,3	210,4	195,7	200,9	190,4	181,1	209,4
	213,6	178,3	210,3	194,6	200	188,4	180,2	208,3
3	226,1	178,2	208,6	193,6	198,6	188,7	179,1	206,5
	211,8	176,3	207,5	192	197,7	185,2	177,7	205,3
4	210,4	176	205,6	191,1	220,6	185,3	175,9	203,1
	208,5	174,7	204,9	189,1	195	183	174,8	202,8
5	208	173,7	202,6	188,5	192,6	182,6	173,8	199,9
	205,9	172,1	202,2	187,2	191,9	180,8	172,8	198,3
AVERAGE	213,8	178,6	208,4	193,0	200,9	187,1	178,6	206,2
S.D.	5,94	5,95	4,60	4,08	7,97	4,21	4,29	5,22
C.V.%	2,78	3,33	2,21	2,11	3,97	2,25	2,40	2,53

production results - ESP perforated tipping paper, 3.0 mm zone width, nominal porosity 200 C.U.

Zone No. Sanning Turns	zone 1	zone 2	zone 3	zone 4	zone 5	zone 6	zone 7	zone 8
1	223,3	217	216,4	203,5	208,2	196,7	211,8	223,9
	221	206,3	215,8	202	207,2	194	210,5	222,8
2	219,3	204,4	212,3	199,7	204,7	192,6	208,5	219,6
	217,8	202,3	211,6	198,4	204	190,7	206,5	218,8
3	219,3	204,4	212,3	199,7	204,7	192,6	208,5	219,6
	217,8	202,3	211,6	198,4	204	190,7	206,5	218,8
4	214,2	199,5	206,7	195,4	199,3	186,5	200,7	212,7
	213,2	197,6	206,5	193,7	197,8	184,9	200,9	212,1
5	214,7	221	207,7	195,5	199,6	188,3	204,5	213,9
	213,9	198,5	207,4	194,4	199,5	186,9	202,9	213,4
AVERAGE	217,5	205,3	210,8	198,1	202,9	190,4	206,1	217,6
S.D.	3,20	7,37	3,44	3,11	3,42	3,53	3,64	4,04
C.V.%	1,47	3,59	1,63	1,57	1,69	1,85	1,77	1,86

production results - ESP perforated tipping paper, 3.0 mm zone width, nominal porosity 200 C.U.

Zone No. Scanning Turns	zone 1	zone 2	zone 3	zone 4	zone 5	zone 6	zone 7	zone 8
1	242,7	208,2	217,8	215,7	191,7	196,4	206,2	215
	221,5	206,2	217,3	196,7	189,8	199,2	203,1	212,6
2	221,1	205,7	217,9	195,8	190,8	202,5	205,2	213,4
	221,1	204,7	217,6	195,2	188,8	188,4	201,3	208,7
3	219,4	203,3	216,6	194,6	189,2	191,6	202,8	210,5
	219,1	202,8	216,9	193,4	204,8	185,6	198,7	207,6
4	217,9	202,1	215,6	193	188,5	191,4	200	209,2
	217,1	201,8	214,8	200,4	186,1	184,1	204,3	206
5	217,2	227,3	216,3	192,4	188,4	189,4	201	230,3
	216,6	200,6	214,7	191,5	186,2	184,6	196,7	203,9
AVERAGE	221,4	206,3	216,6	196,9	190,4	191,3	201,9	211,7
S.D.	7,31	7,34	1,12	6,72	5,07	5,96	2,82	6,98
C.V.%	3,30	3,56	0,52	3,41	2,66	3,12	1,40	3,

Portfolio - IPM International Perforation Management

IPM is a relative small hi-tech engineering company, based in Recklinghausen/Germany and Asia. With international specialized engineers and competent partners in Germany and China we are develop, design, manufacture, tailor-made, install, commission electrostatic micro cluster or laser perforation systems and machines for fast moving paper webs or other material treatment for mass products.

As well with sophisticated, intelligent sensor scanner porosity controls technology for global sales and potential customers as ready-to-use projects.

Strong hands-on engineering, demanding time at clients side, qualification, training, technology transfer for maintenance, operation personnel in quality as well quantity control are essential parts of our services for prosperous long-term cooperation with global clients.

The founder of IPM Mr. Werner Grosse, working since 1979 as application engineer, project, operation manager, technical director, technology expert and entrepreneur in international field of applied electrostatic and laser processes as well in optical online porosity sensor scanner measuring for tobacco, paper, refinement, packaging, printing, tobacco and other industries. During his professional career, collaboration in research assignments he initiated 46 inventions and 34 patents, outside of EEC and in China as well. Thanks patented technologies and production processes new generations of refinement procedures, products properties, characteristics, application fields, production machines and optical online controls has been developed. It includes world wide new in-situ dyne surface tension measuring process at fast moving plastic films and foils.

After he became a self-employer and entrepreneur in 1992, the GmbH was established in 1993. This resulted in an expansion of electrostatic perforation technology into application fields such as filter, cigarette, tipping, packaging, printing, bag, food and non-woven for paper refinement and packaging industry. Since 1994 the GmbH belong to an international supplier group.

After many years of prosperous cooperation as shareholder and managing director, Mr. Grosse left the GmbH at the end of 2001 in order to enhance innovations with his own engineering company, IPM International Perforation Management, in January 2002 to design tailor-made production machines for mass products which among other high demands in quality have specific outstanding product characteristics in cooperation with relatively large clients, especially in Asia, USA and South America.

Apart from this business he has joined national, international organizations whose aim is to enhance innovative, creative, patent conforming, educational targets and which exchanging of technical, economical knowledge. As a result of his membership in several organizations and due to his work in the field of micro perforation, material treatment and porosity, scanning and vision control technology, Mr. Werner Grosse has given many lectures, published a great number of technical papers and engineering reports which are available in German, English, Spanish, Mandarin, French and Italian.

Mr. Werner Grosse received government honors from China in 2004 and from other countries later on for his expertise as foreign entrepreneur for added values of innovative hi-tech production technology achieved by transfer of knowledge and successful cooperation with large industry Groups in China and others to build new machines to improve significant production processes.

Honor China Yunnan Province Government

<http://bfe.yxrs.gov.cn/article.asp?id=2005092011030968>

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IPM International Perforation Management and his engineer team operates as technology experts with project managements in the tobacco, cigarette making, supplier, paper, packaging, printing, material treatment, automotive, robotic handling and other hi-tech industries.

In mechanical and electrical engineering, manufacturing, delivery of entire perforation electronics and long term spare part guarantees IPM cooperating since many years with two German contract suppliers which manage all commercial details and goods deliveries independently to global clients.

For twin bobbin or wide web laser perforation machines we are in tight cooperation with competent hi-tech industry partners and cigarette machine manufactures in China.

Production Technologies

Perforation

Web material as regenerated cellulose films, filter, cigarette, tipping, roll-your-own RYO make-your-own MYO, wall, decoration, transparent, coated, laminate, bag or packaging paper, bonded fabrics, spun bonded non-woven, food, medical, under roof house or agriculture vegetable covering, packs, technical textiles, fabrics, laminate with base weights from 20-180g/m², thicknesses from 10-80 microns, up to 20 g/m² LPDE coating are perforated electrostatically micro, or by laser with micro holes for wide range of application purposes.

Technology

Electrostatic micro cluster perforation or material treatment, based at micro discharging and sparking, by Bluemlein and Plasma Tunnel effects with gas atomic ionization in Nanosecond time windows. The pores are normally statistical irregularly distributed up to 80 microns and analogically, under laser micro perforation, arranged in sizes from 60-200 microns, at best non-inclined holes and hole rows of diverse arrangement comprehension. For the naked human eye invisible electrostatic micro perforations may be arranged in areas or zone bands with specific distances within its web.

Controlled pores from 0.050-80 micron diameters by sequences up to 16 million pores per second, 0.1-4.0 mJ discharge energy for each pore. Process and power electronics patent granted with DE10328937.

Performance

Arrangements of zones are usually carried out in width from 2-6 mm and pores density of 15-250 pores per square cm whereas the perforation of areas results in pore densities of up to 5 million pores per m² in surface-all-over design. Electrostatic perforations allow porosity levels from 80-2,500 Coresta Units (ml/min/2cm², 1,000 Pa), equality down to 3 Gurley material web widths from 100-2,000mm at web speeds up to 600m/min, depending on porosity and material consistency in relation to its ability to perforate.

Physical properties

One of the foremost postulation which can be applied to many application purposes and products containing bonded fabrics, bag or packaging papers, non-woven and others with gas or steam permeability but water impermeability will be found at the application stage of the electrostatic micro cluster perforation.

Which means pore size 0.050-80 microns by up to 5 million per square meter.

This is due to the water's greater surface tension as hydrophobic property which hampers the permeation through the relatively small micro pores, instead hydrophilic impacts. These and other physical advantages of relatively small pores but high-density range necessarily demand the application of micro cluster perforation method because alternative perforation, web treatment processes as plasma jet, corona, flame, micro needle or laser perforation are not feasible, large pore sizes, low pore density, very expensive or simply uneconomical would not allow successful product application.

Products, applications, advantages with electrostatic micro cluster ventilation, perforation

- breathable, micro ventilated mass products, cigarette, tipping, filter, packaging, plug-wrap, refinish, fine paper
- booklet, bible, printing, magazine, promotion, flyers or newspaper with improved surface property
- decoration or gift paper with thin coating films
- PVC laminate, Vinyl, decoration or wall paper to eliminate one side condensation effects
- enable control gas exchanges, avoid rises of mildew or rottenness
- joints, corner, taps, Kraft paper strips to avoid glue bubbles with enable material diffusion
- fleece bonding material with thin plastic film layers for outdoor, under roof protection, covering, wooden houses which enables gas exchanges
- technical textiles for gas exchanges to avoid condensation processes
- sophisticated hydrophilic but hydrophobic product properties by certain purpose condition
- breathable overalls, heavy duty or disposable work dresses, trousers, aprons, thin PE fleece material
- thin PP or PE contacted Kraft paper bag, multi wall, layers, plies cement sacks, plaster, maize, grain, pet food, granulate or powder for gained air outlet or blowing during filling processes with multiple time reduce efficiency
- keep packed products in the same barrier condition as without micro perforation
- extending storage, live time or durability of certain goods and products
- biotopes and prevention of water pollution
- real or imitate leather, cloth inlets for non sweat wearing, high humidity, tropical condition

- soap, deodorant, hygiene, beauty creams, baby care or other packaging products which needs smell suggestion for marketing indication and buying advantages
- vegetable, flowers or food with paper packaging replacements for gas exchanges
- bread, rolls, fruits or food to improve the freshness and aroma
- high breathable biodegradable packaging material, environment friendly,
- high-holes-density multilayer foils for industry, medical, bioengineering, filtration purposes
- surface modification or improve roughness
- micro filter, membranes, battery separation layers, bio or lab analytic, alcohol, liquid or blood filtration
- clean room, agriculture plant applications to reduce or gain growth rates of bio processes

Process integration

It is also used especially for additionally treating materials when aiming special characteristics by physical or regular process reasons what cannot be achieved by other process technologies. Moving material web base weights from 20-180 grams per square meters by thicknesses 10-80 microns are possible to use. Including defect inspection, process automation, moisture vapor transmission rate, abrasion resistance of lamination, water proof, ventilated or breathable fabrics.

IPM state-of-the-art industrially approved, sophisticated, compact, multi functional, in-line sensor scanner systems together with electrostatic laser perforation technology operates precise and reliable 24/7, are integrate able into existing rewinding, slitting, spooling, spreading, printing, labeling, complex production manufacturing lines or other machines and production processes.

Also, they can be used as completely independent micro surface-all-over or zone perforation unit. Full new ranges of applications will be made available total new products with special features and properties.

Laser micro perforation

Laser perforation in general, possible to perforate by pulse or enlarge, focus laser beams are holes sizes 60-200 micron at density of holes of typical 10-30 holes per cm, sequences by 100,000-400,000 holes per second at a maximal of 16 punctured laser rows cross web with traditional systems or machines.

Means for cigarette, tipping, plug-wrap, filter, laminate, printing, flexible packaging or other material webs. By porosity levels of 100-3,000 C.U. normally in web widths 100-1,000mm, by web speeds up to 600m/min, depending on porosity and material consistency in relation to its ability to perforate.

IPM micro laser cluster perforation

IPM laser cluster treatment perforation technology LPM-1, patent granted as DE102004001327, operates with two Co2 or other laser sources inputs, up to 4 Kilowatt twin level vacuum beam multiplexer to generate up to 200 individual laser output channels, perforation or treatment heads cross web or sheet material.

Combines automatic head positioning, auto focus setting, speeds up to 400m/min, flexible web width up to 2,000mm by up to 2,500,000 holes/sec.

Jumbo roll-by-roll production, online sensor scanner permeability, porosity, perforation line measurement, trend feed-back, high automation, PLC process visualization and other features. Each laser micro perforation lines can achieves 100-1,000 C.U.

Other industry fields

The conception of high power, twin level, vacuum, high spins laser beam splitter into the multiplexer enables many other options of industry fields as cutting, cut-off, welding, surface finishing, drilling, ablation, cleaning, micromachining, polishing, forming, melting, surface treatment, roughness improvement.

Each up to 200 laser perforation or treatment head are connect via hollow waveguide fibers HWG HCW for flexible laser beam leading cross webs or static sheet material.

To position easy fast in X-cross and Y-down web direction or exact location at static placed sheet material. That full flexible automatic process with optical devices opening outstanding possibilities in industry, metal, plastic, domestic, tobacco product, medical, hygienic, wall covering, security cards, bank notes or food application. LPM-1 means cluster treatment at wide web, surface-all-over, line, zone or others materials.

Anti piracy, counterfeiting laser product design

As known offline laser perforation machines and processes are generating strait holes line in web direction at running tipping paper or other material sheets. Excluding spray laser designs which looks similar as random holes into certain zone areas as electrostatic perforation.

The patent pending DE102004012081 Micro Laser Line technology generates cluster pattern, micro holes, sinus, waves, zigzag, cryptograms, logos, perforation scripts, holograms, brand names or other kind of micro perforation designs in web direction which can look likes a group of micro laser lines.

Concerned tipping paper means non coaxial circumference at the cigarette filter.

High speed spins laser beam divert, steering, mirror scanning, flipping element controls each single laser beam and perforation line cross material which are precise focus for micro holes in ranges from 50-120 micron. Co2 or other laser sources are to use.

Ultra high speed laser beam steering

Technologically performed as ultra fast scanner device up to 4,000 Hz or 240,000 rpm as real galvanometer alternative, precise laser beam deflection up to 4 Kilowatt optical power by 8-14mm diameter, actuator with metal optics or asymmetrically, rotary reflection cones which movement sequences are precise synchronize able with material speed. Envelope curves of selected perforation pattern are storage and calculate able by PLC control before single hole and hole groups supervised during production processes.

Product process advantages enable total different product indicators and milestones against other laser perforation or treatment processes which allows significant product property, trademark indications, IP claims, unique company features as micro perforation of tipping, cigarette packaging, other paper or material.

E.g. wide laser perforation group as common active ventilation zone to obtain smoking advances with better air stream distribution into the cigarette filter.

Perforation line guiding around the cigarette filter rod, tipping paper strip by freedom of lips area, other food, domestic or industry products assure constant porosity results.

Several pattern or wave line design for different brands, number of holes or pattern per cm length are constant e.g. 10-20, total porosity 100-1,000 C.U., hole sizes by 50-120 microns, densities 100,000-500,000 holes per second in total, 1-6 perforation pattern, lines, marks or scripts can combines in one group, micro perforation holes, pattern quality or porosity remains in standard levels.

Other flexible web material, substrate, products are treatable in similar processes, at existent laser perforation machines are able to modify with new optical, sophisticate mechanical, control elements.

Modification with low investment, finance budget because exchanging of certain elements, complete devices are adaptable at existent offline laser perforation machines or other systems.

Capability to adapt super speed beam steering devices or units at online perforation units at cigarette making machines up 12,000 cpm.

Power switching converters

IPM developed a dual high power, high voltage, medium frequency switching converter which works with hybrid drives, full in order of EMI, EMV, NEC, CE restrictions, compact semiconductor power electronics stages, supporting capacitors and ferrite transformers generating ultra short high voltage pulses and sparking bursts. Advantages are based on uses of standard circuits with extended semiconductors for cluster, corona substrate treatment, ac/ac, ac/dc, converter, drives, frequency, upward, downward converter, power electronics supplies.

Industry applications for electrostatic micro cluster perforation, converting, drives, others with IGBT, MOSFET, HVFET power stages. In high-power, high-current, high-voltage circuits to obtain micro perforation, surface treatment, modifications, corona treatment, drives or other switching applications by frequencies up to 250 KHz, Uce up to 1,400 Volt, power levels up to 50 Kilowatt.

Higher power efficiencies by low switching losses are further advantages. Precise pulse timing by certain time window with constant or variable frequencies generating high-voltage sparks and holes sequences into fast moving flexible materials.

Repeat frequency of entire circuit can up to double switching frequency of each semiconductor. The patent is granted as DE10328937.

Online porosity sensor scanner measurement

Patent pending DE10251610, patent granted in China 200310104764 for stationary or sensor scanner measuring at flexible webs or other material sheets to detect very precise, reproduce their specified product properties while production.

OPSS-1 OPRL-1 sensor control systems are equipped with multiple monolithic color sensors, precision line lasers, CCD image devices and internal ATMEL controller, firmware, high-speed data link, scanning speeds 20-500mm per second, flexible material web widths up to 5,000mm, measuring gaps 2.0-5.0mm, inline detection of permeability, porosity, spectral transmission, opacity, extinction, particle absorption, porosities 80-5,000 C.U. respective from 50 down to 3 Gurley, speeds up to 600 m/min, position control of perforation lines with 0.1mm accuracy, 0.1-200 microns pore diameter by up to 300 pores per cm².

Real time data determining of certain parameters, optical transmission, spectral grades, porosity integrals, envelope curves, internal calculated measuring values.

Thus direct with close-loops and feedback to power electronics of fabric treatment units. Micro perforation or other system makes it possible to compensate small changes in web treatment parameters and their partial locations. That each jumbo roll as well single, twin or quad bobbin sets can be quality controlled without intermediate stops in order of ISO 9001/9002 demands.

IPM - Products - Services

Electrostatic micro ventilation, perforation machines PS-1000-2, PS-1200-3, PS-1600-2, PS-2000-1 for cigarette, tipping, filter, packaging, plug-wrap, fine, Kraft, cement sack, bag other paper, agriculture or food products with base weights from 30-160g/m², web width 50-2,000mm, porosities from 80-2,500 C.U., or alternative from 50 down to 3 Gurley, hole sizes from 10-100 microns, hole densities from 120-260 holes per cm², zone widths from 2.0-6.0mm, surface-all-over perforation up to 2.5 Million holes/m², up to 16,000,000 holes per second by web speeds up to 500m/min. Up to 60 perforation channels or 30 bobbin sets, jumbo roll-by-roll production up 25,000 meters, automation control, OPSS-1 porosity sensor scanner measurement, PCB unit feedback, PLC process visualization. Annual production output up to 4,000 tons of tipping paper by 220 C.U. with triple perforation sections. Patent granted DE10328937.

Twin bobbin laser perforator L-400 in cooperation with laser system manufactures in China, tipping paper weight 32-38 g/m², up to 8 laser lines, porosities from 100-1,500 C.U., holes sizes 80-150 microns, densities 10-20 h/cm, up to 150,000 holes per second, speeds up to 300 m/min, annual production output up to 30,000 bobbins by 300 C.U.

Quad bobbin electrostatic mirco perforation machine PS-250-4 up to 4,500 meters bobbin tipping paper length, slim rolls up to 25,000 meters at unwind section, roll-by-roll production with 16/24 bobbins non stop, with/without integrated slitting, flying-splice unit for simultaneously quad bobbin set production, OPSS-1 online porosity sensor scanner measuring with close-loop, quality/quantity controls of each perforation zone, porosity range 80-800 C.U., deviation CV <3 % by 260 C.U., tipping web width up to 300mm, speeds up to 600m/min, hole density 120-260 h/cm², zone 2.0-6.0 mm width, holes 10-70 microns, up to 7,000,000 h/sec., annual output up to 120,000 bobbins by 300 C.U. High automation level, patent granted DE10328937.

Online porosity sensor control OPSS-1-A/B, OPRL-1-A/B for electrostatic or laser perforation machines, porosity 80-5,000 C.U., speeds up to 600 m/min, web width up to 2,000mm, feedback of each perforation zone, porosity with multi colour sensor, zone and line position control, accuracy of 0.1mm with precise laser line unit, sensor controller firmware, RS-232 serial link up to 230,400 Bit/s, RS-485, Ethernet, USB, industry PC, C++, process visualization, quantity, quality, statistics, link to PCC/QCC. Patent pending DE10251610, China patent granted 200310104764.

IPM business

Technology expertise, consulting, support, improvement, modification, overhauling, high tech engineering. Sales, manufacturing, installation, commissioning, project management, service. For tailor-made, turn-key electrostatic or laser micro cluster perforation, high-holes-density ventilation machines, online porosity sensor scanner systems for entire production lines world wide.

Press releases and technical reports are published at websites.

Cooperation with Chinese partners

MLL-1 laser line cluster perforation, ventilation, anti piracy design for tobacco or other mass products, enables advance smoking air streams into cigarette filters by further product advantages, high speed rotation of un symmetrically mirrors, cones for laser beam steering, up to 240,000 rpm, holes sizes from 60-150 microns, densities 10-30 h/cm, porosities from 100-1,500 C.U. by up to 300,000 holes per second. The MLL-1 micro-laser-line perforation and material treatment enables large numbers of capabilities for hole or treatment positioning with different pattern, design, waves, zigzag, cryptograms, scripts, lines for unique anti counterfeiting indication and others. Special remark of MLL-1 creates fundamentally new product properties, e.g. final products for mouthpieces with tipping paper at cigarette filter or other tobacco, cigarette packs, packaging or security products. Specific indication of brand names which are recognizable for everyone and product buyer, if the micro holes or pattern are to see with magnified glasses only. Or touch able as Braille scripts as micro cluster cryptograms. Patent pending DE102004012081.

LPM-1 wide web laser micro perforation machine, sheet material treatment particular for paper products as cigarette, tipping, filter, packaging other mass material production, up to 200 laser perforation or treatment heads cross web or sheet material, automatic head positioning, focus setting, dual 4 Kilowatt Co₂ others laser source inputs, beam factor M₂<0.9, twin level multiplexer, flexible hollow fibers, web widths up to 1,200 mm, speeds up to 400 m/min, 25,000 metres jumbo roll-by-roll, fully automatic production, PLC process visualization. Integrated OPSS-1 porosity sensor scanner control, perforation holes from 60-150 microns diameter, densities 10-30 h/cm, porosities from 100-1,000 C.U., up to 2,500,000 holes per second, annual production output up 1,800 tons by 400 C.U. Patent granted DE102004001327.

OESP-1, OLP-1 ventilation for mass products at cigarette makers or packers development with a Chinese firm consortium, uses of IPM mini laser multiplexer and hollow fibers up to 3,000 mm length, see [above patent](#), designed for 4 or 8 laser perforation lines, sealed-off laser source 400 Watt, 48-64 mm bobbin width, precise perforation round or oval holes from 60-150 microns, porosities from 100 up to 900 C.U., cigarette ventilation levels from 10-80% by twin or quad lines at each bobbin strip side, up to 14,440 holes/s in total, up to 12,000 cpm or speeds up to 150 m/min.

Flexo & Gravure Asia 1-2008 http://www.flexo.de/download/fga/1-2008/Inhalt_FGA_1_2008.pdf

On requests - more details about projects references in tobacco and packaging industry.

patent download <http://www.microperforation.com/englishengineerreport.html>

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