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nano micro perforación electrostática y laser

ópticos porosimeters para los papels

Perforación de hojas continuas

Los materiales o sustratos en forma de lamina, como papeles para cigarrillos, papeles para recubrimiento de boquilla de cigarrillos, papeles de filtro, papeles especiales, papeles Kraft, papeles para sacos o para embalar, telas no tejidas, non-woven, textiles técnicos, películas, laminaciones, papeles recubiertos, etc. con un gramaje de 20 g/m2 a 150 g/m2 se pueden someter a una MICRO perforación o una MACRO perforación para las más diversas aplicaciones.

Con la MICRO PERFORACIÓN los poros se distribuyen estadísticamente en forma irregular y en tamaños variables. Con la MACRO PERFORACIÓN se ordenan en tamaños iguales y por pistas o hileras de perforaciones de diferentes disposiciones. Invisibles a los ojos humanos, las MICRO perforaciones pueden distribuirse de forma plana o también por zonas, en áreas y a distancias determinadas dentro de las pistas de perforación. Mediante un proceso ELECTROSTÁTICO se logran perforaciones con tamaños de 1 - 150 um.

Perforaciones de 60 - 200 micrones se obtienen con rayos láser pulsados y ampliados.

Las perforaciones planas ESP permiten lograr una concentración de poros de hasta 2 millones de poros/m2 a una velocidad promedio de hasta 16 millones de poros/segundo. Las perforaciones por zonas con anchos de 2 - 6 mm máxima permiten generar hasta 300 poros/cm2.

Exigencias fundamentales como las requeridas para la aplicación en telas no tejidas Vlees, telas de materiales sintéticos con buena capacidad de respiración, y sustratos para empaque y embalaje, donde se requiere una permeabilidad a los gases y una impermeabilidad al agua, también son áreas de aplicación para la técnica de la MICRO PERFORACION ELECTROESTATICA, ya que el agua, debido a su más elevada tensión superficial, no logra penetrar los micro poros mientras gases o vapores de agua si pueden ventilarse por estos.

Perforación del papel para recubrimiento de boquillas, de bandas, o de papel de cigarrillos, para incrementar la ventilación

La perforación electrostática se aplica especialmente a la ventilación de cigarrillos, con o sin filtros, para generar un "bypass" de aire. En esta aplicación se somete el papel del cigarrillo sin filtro, o el papel para el recubrimiento de la boquilla de cigarrillos con filtros, a un proceso de perforación por medio de la técnica MICRO MACRO PERFORACION.

Mediante este proceso se logra modular el grado de ventilación del cigarrillo y reducir la inhalación de elementos contaminantes para el fumador (nicotina, condensado, etc.)

Medición óptica online de la porosidad o de la permeabilidad

Como los sustratos a perforar o los sustratos con porosidad natural, se mueven a velocidades de hasta 600 m/min y en anchos hasta 2000 mm, una medición neumática, es decir, una medición de la porosidad en contacto directo con la superficie del sustrato, resulta extraordinariamente difícil.

A este método de medición se suman complicaciones adicionales, como aumentos en la fuerza de tracción, desgastes del material con ensuciamiento contaminación del cabezal de medición, formación de arrugas, fugas en el cabezal de medición y problemas con la alineación.

Por lo tanto, para las películas con porosidad natural o micro-macro perforaciones, se impone un sistema de medición óptica para la determinación de la transmisión, con conversión matemática hacia la permeabilidad neumática de gases. Considerando los diferentes productos, la velocidad de aplicación con control online y los diferentes diseños de aplicación geométrica de las perforaciones, se logra mediante la técnica de medición óptica de porosidad, y en forma muy satisfactoria, el cumplimiento de los requerimientos exigidos, con una formidable reproducibilidad de los valores de medición.

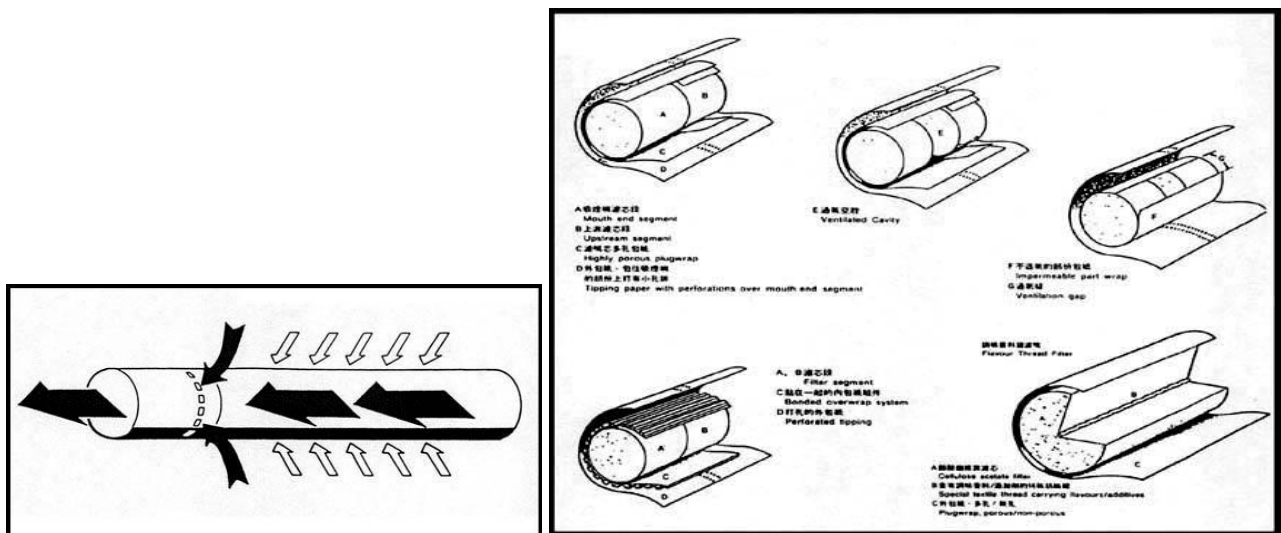
1. Nano micro perforacion

La perforación electrostática alcanzó una amplia difusión en la MICRO perforación de bandas de papel fino, y también, los MICRO POROS en materiales flexibles, para empaques en bobinas y los productos fabricados con estos. Estos, se convierten en materiales permeables a vapores o gases con respiración activa, pero sin embargo, permanecerán impermeables para los líquidos en un nivel importante.

De esta manera actuarán como barreras, justamente según lo requerido en la bandas con “coating” o revestimientos plásticos.

Los materiales tratados de esta manera son de interés para campo de los papeles finos para cigarrillos, el empaquetado, en el llenado, en la industria de los no tejidos y para otros campos técnicos de aplicación. Los micro poros se pueden insertar a la banda en movimiento en forma electrostática, en procesos con velocidades medias y hasta elevadas, e inclusive para grandes anchos del sustrato a tratar.

En el pasado y al igual que ahora, los papeles finos y sustratos, con gramajes entre 20 y 150 g/m² han sido perforados electrostáticamente en todo su superficie, en zonas, líneas o áreas especiales. Entre ellos se encuentra el papel de cigarrillo, el papel fino para los extremos de cigarrillos ventilados, el papel de filtro y papeles Kraft, así como varios sustratos no tejidos y otros materiales en bobinas.



Poros con tamaños desde 1 hasta 150 micron, distribuciones de éstos hasta 2 million/m², con perforaciones en toda la superficie de hasta 240 poros/cm², y con perforación de zona a velocidades de 16 millones poros de segundo, se pueden alcanzar mediante la micro perforación electrostática.

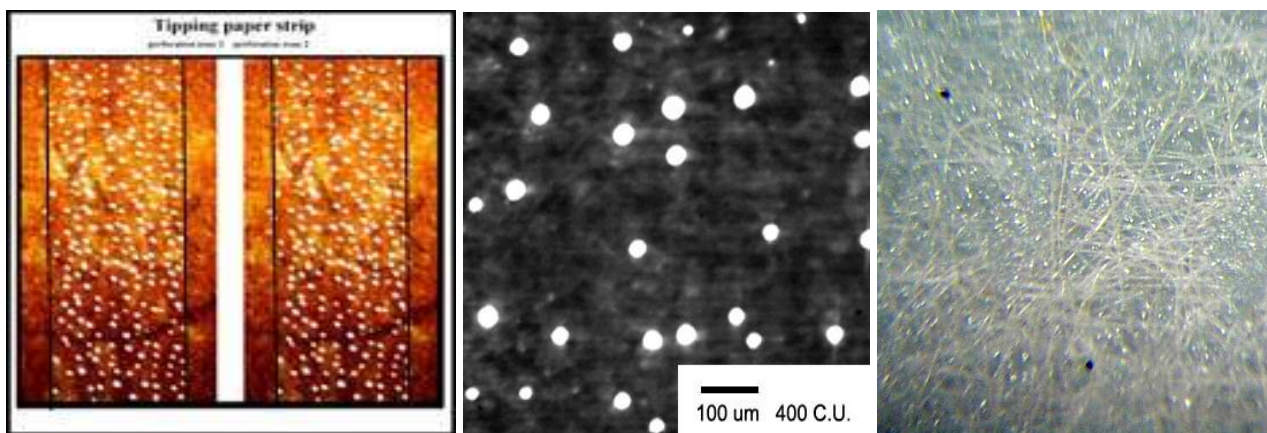
Los anchos de banda y las velocidades de la máquina, normalmente entre 100 - 600 m/min, dependen de las aplicaciones, del formato del producto, de la consistencia del material a tratarse y de los valores de permeabilidad deseada.

2. Principio de la perforación

Perforaciones Electroestáticas que generan micro poros, dependen de la consistencia del material. Microporos con diámetros por debajo de 1 micron, se logran mediante la ayuda de pulsos de alto voltaje, concentrados para aumentar la permeabilidad al aire, a vapores y gases en general, mientras se conserva una impermeabilidad a los líquidos.

La capacidad específica de un material a ser perforado, la calidad de los poros y la eficacia de las perforaciones, dependen de la resistencia dieléctrica, constante dieléctrica, espesor y de la estructura molecular de dicho material, así como de los pigmentos, de los rellenos y la calidad de la superficie.

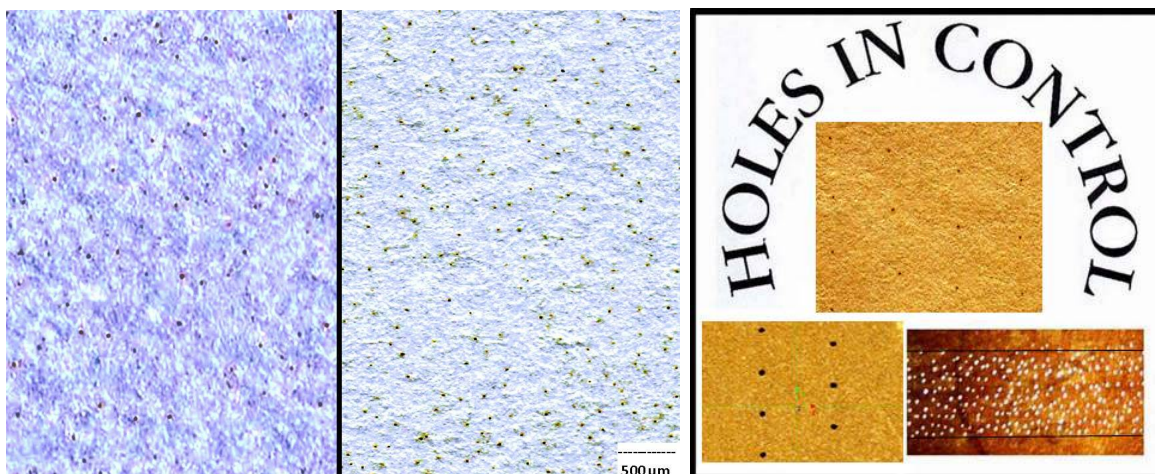
Por lo tanto, la única manera de determinar cuan microperforable es un sustrato, es mediante ensayos previos sobre formatos en hoja o en bobinas pequeñas en el laboratorio de pruebas.



Se ofrecen actualmente instalaciones para la fabricación de perforaciones electrostáticas, en anchos no disponibles hasta la fecha.

La posibilidad de medición en línea, la definición de la zona o área de porosidad o de la permeabilidad de la zona, así como el control de la perforación, permiten una amplia selección del tipo y densidad de los poros para aplicaciones muy particulares y la disposición determinada de poros en el material específico.

Con perforaciones sobre toda la superficie es posible producir nano o micro perforación en bandas de papeles finos, sustratos revestidos, sustratos no tejidos, papeles Kraft, papel para sacos de cemento, bolsas y envases de todo tipo y cualquier clase de bandas de papel para empaquetado, en una amplia variedad de aplicaciones.

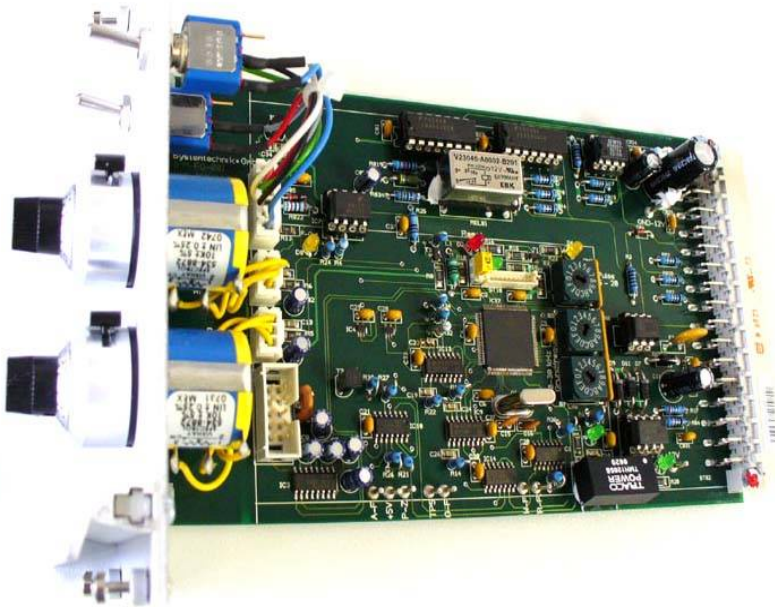


Un criterio de calidad importante, es que la nano o micro perforación sobre una banda no tendría que ser visible. Esto puede lograrse solapando el entrelazamiento del electrodo, mediante el desplazamiento de la banda y optimizando condiciones de energía en la sección de la descarga de la chispa.

Otro punto de igual importancia es lograr la formación del poro exenta de rebabas y residuos, para asegurar que los poros no tengan ningún efecto prejudicial en los procesos de conversión del material perforado o que la presión del rebobinado no altere la porosidad.

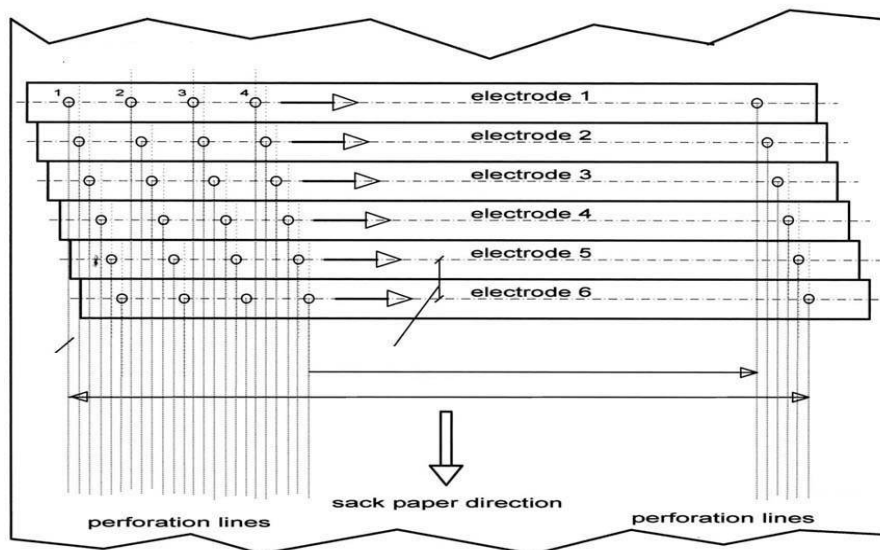
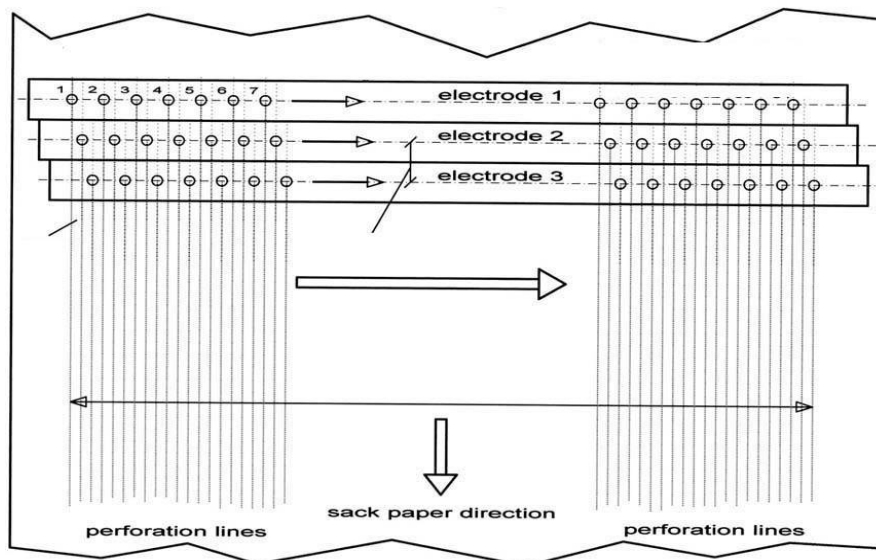
PS-1000 – PS-1200 – PS-1600 – PS-2000 maquinas del micro perforacion

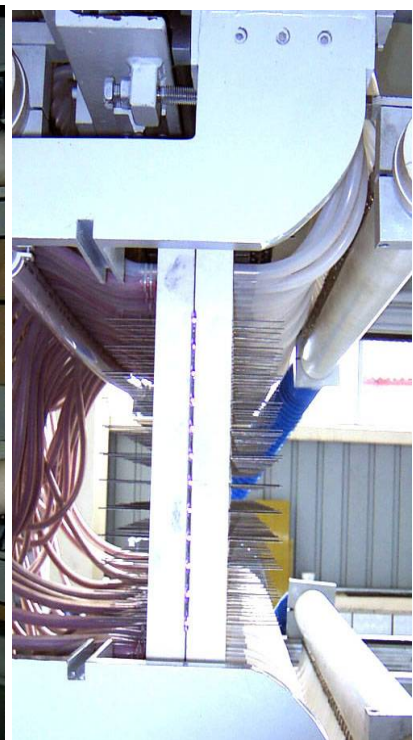
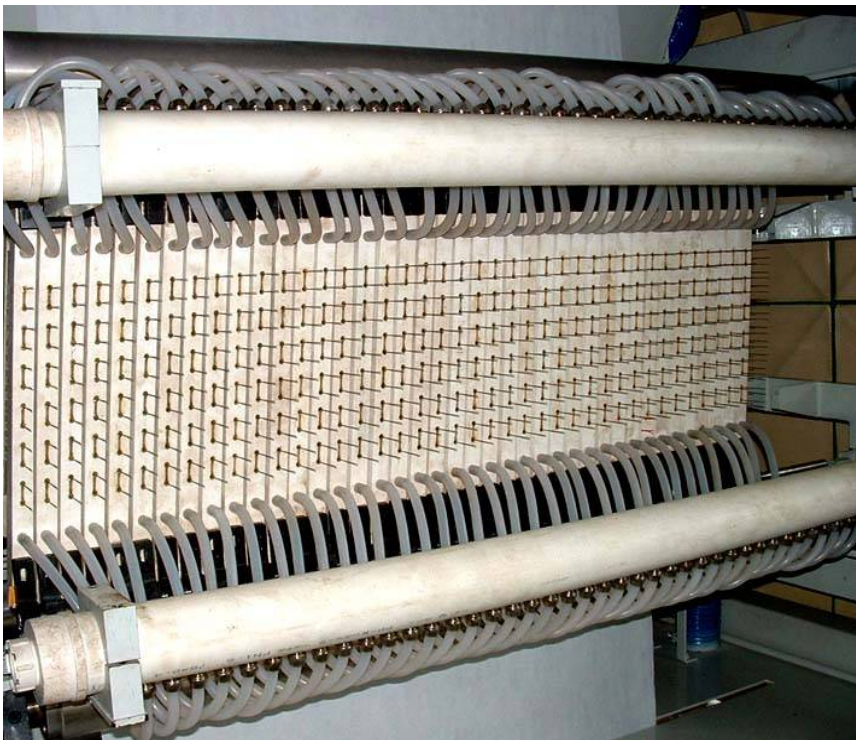




3. Diseño, aplicaciones, producto

- Principios de derivación para los filtros ventilados de cigarrillos
- Resistencia adicional al gas del papel de cigarrillos sin filtro
- Permeabilidad mas alta del papel de filtros especiales
- Procesos de llenado mas rápidos para los sacos y bolsas de mayor tamaño de productos en polvo o granulados como cemento, harinas, cereales, alimentos
- Bandas de papel revestido con PE, coating para intercambio de gas
- Packaging respirable con papeles revestidos para productos alimenticios
- Papeles revestidos con características de barrera para aplicaciones variadas, como p.e. el empaquetado de jabón
- Papeles revestidos para las mercancías que no toleran la condensación puntual
- Películas plásticas especiales o revestidas, para el proceso de filtración para el enriquecimiento con oxígeno o gas
- Películas de múltiples capas especiales para revestimientos impermeables
- Láminas de protección y recubrimiento intermedio de techos con capacidad intercambio de vapores y gases
- Uniones de los guardapolvos desechables de una sola pieza
- Textiles finos industriales, películas con capacidad de respiración
- Bandas de papel Kraft para aplicaciones de construcción en seco

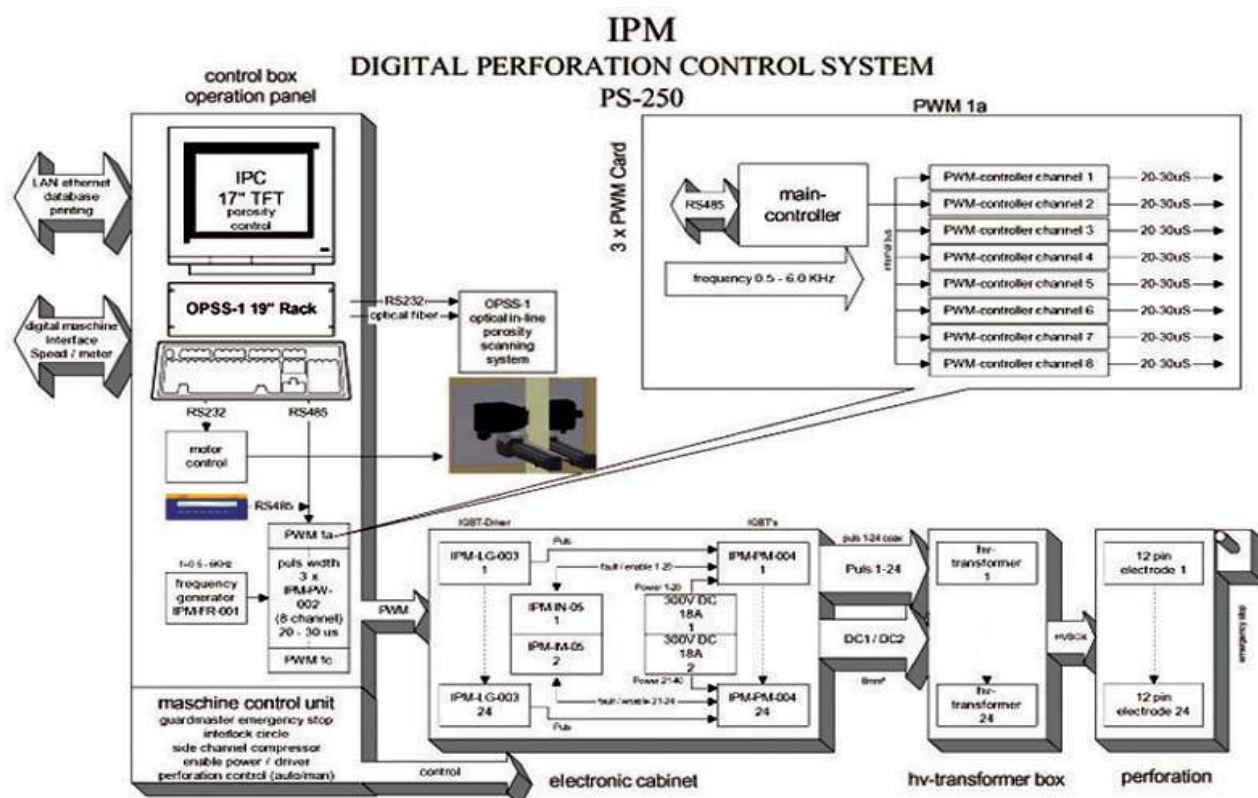
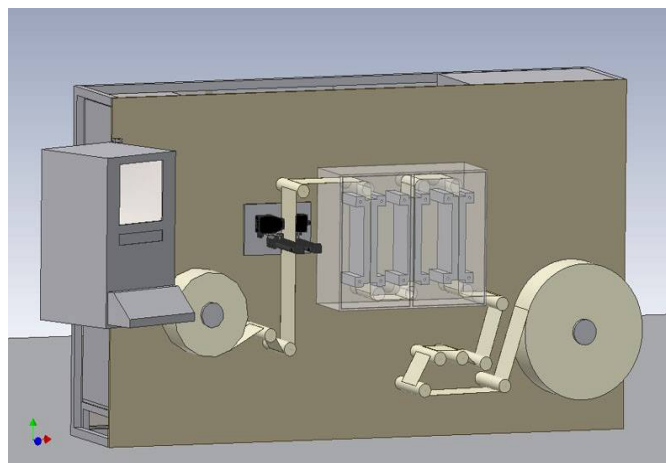
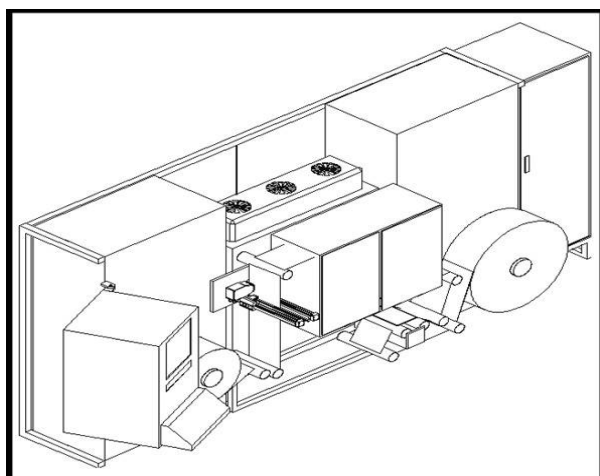
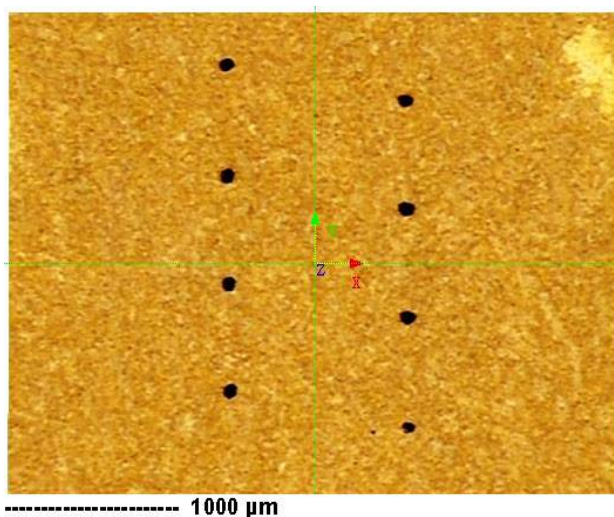




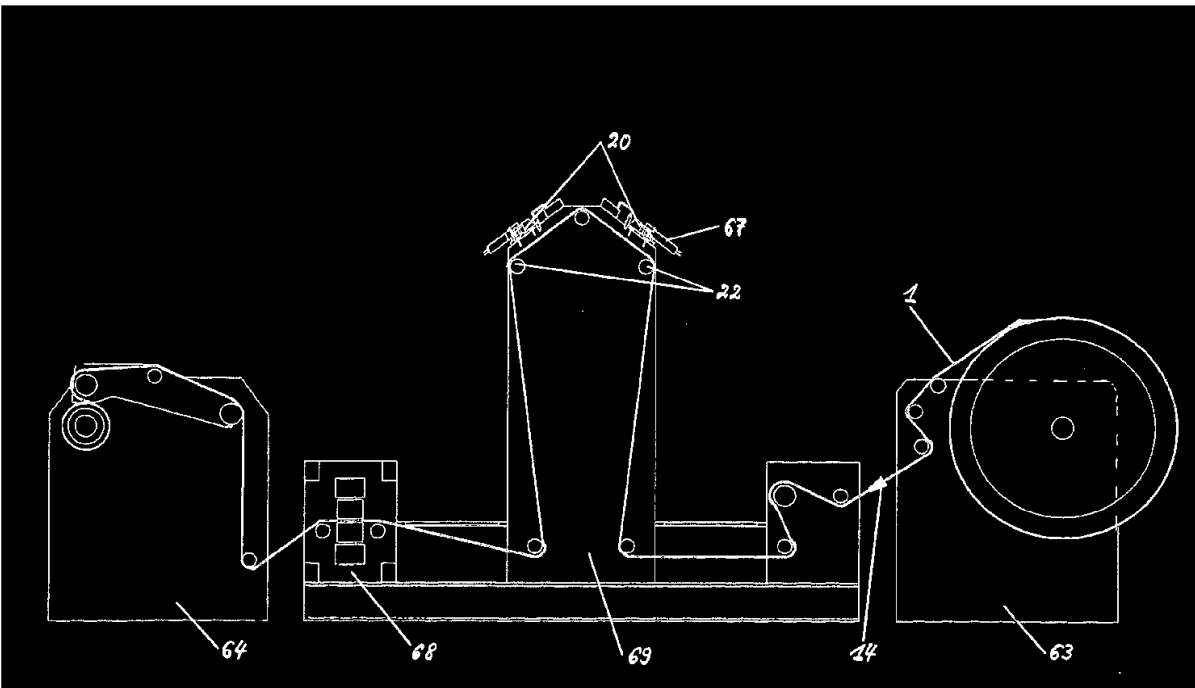
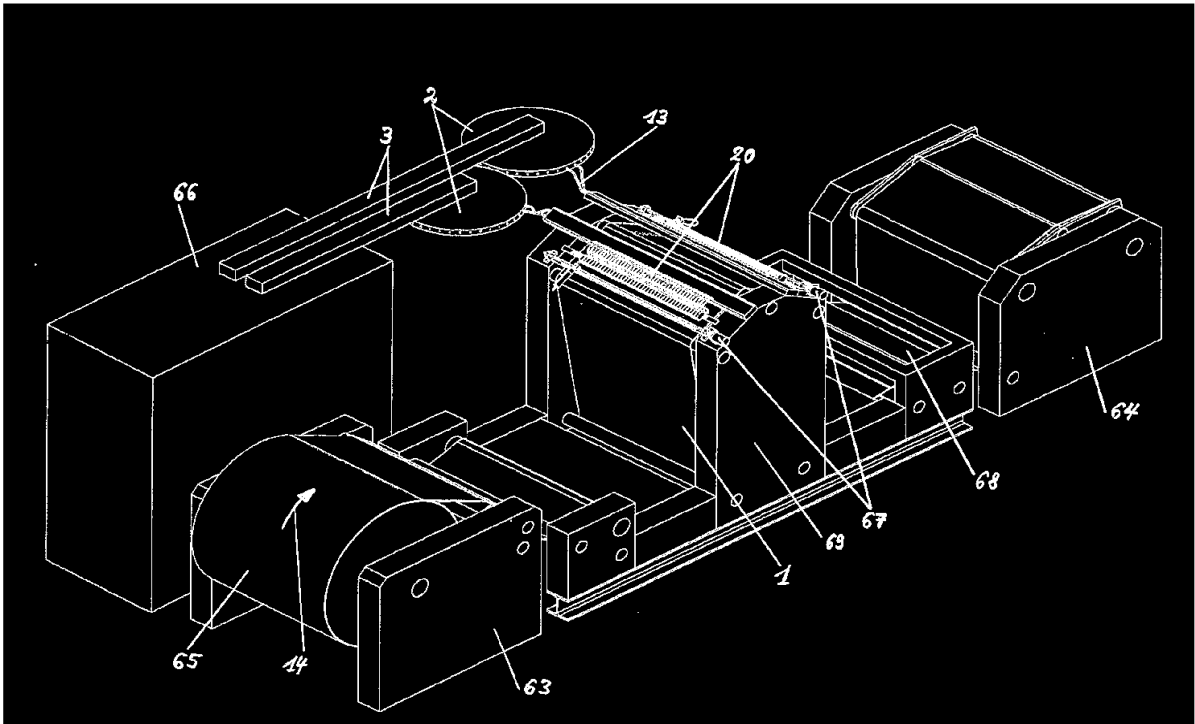
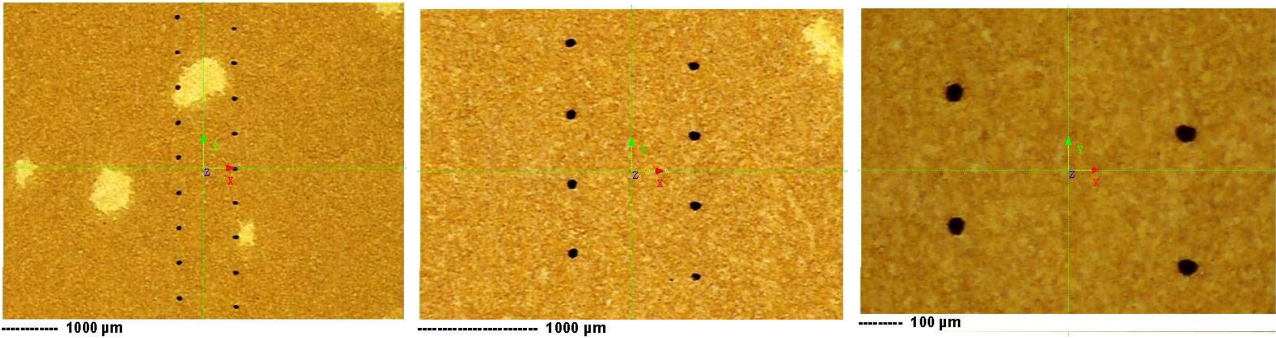
4. Capacidad de diversos materiales a ser perforados

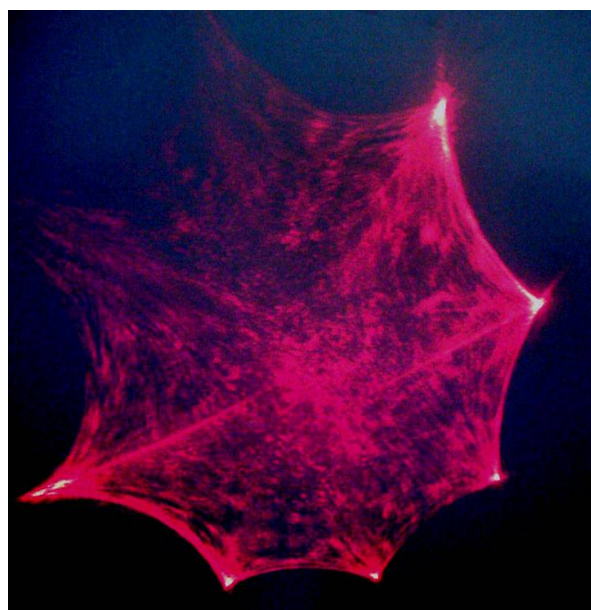
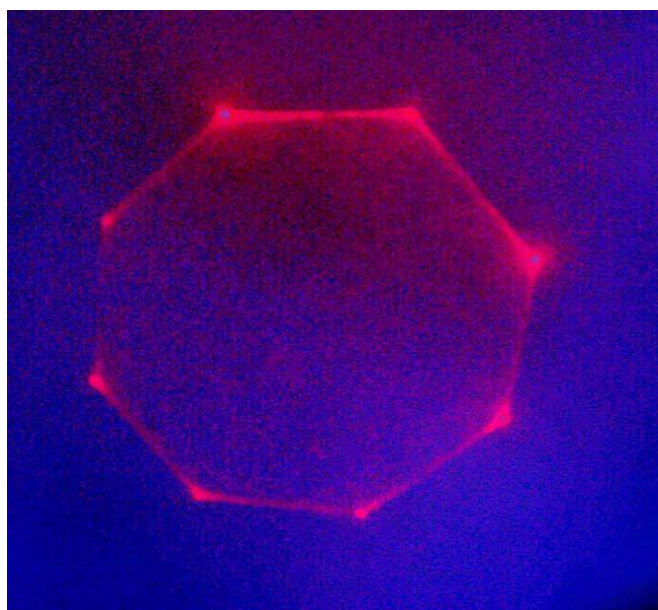
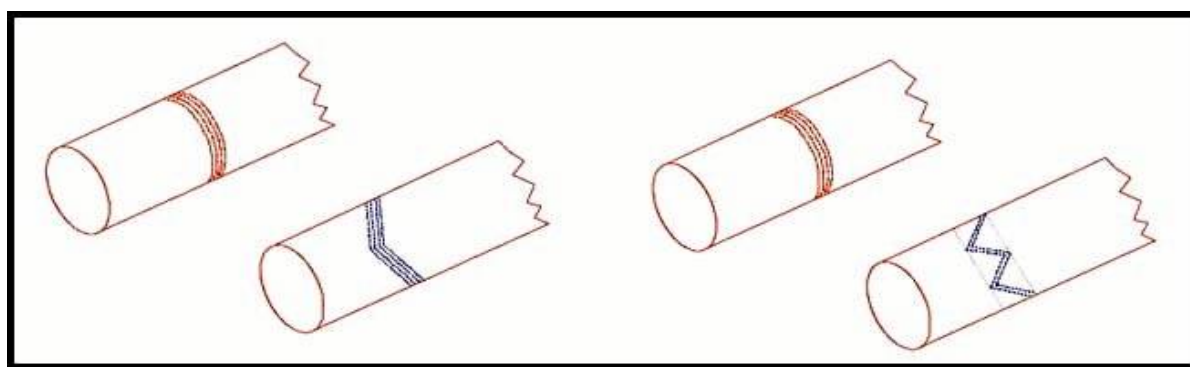
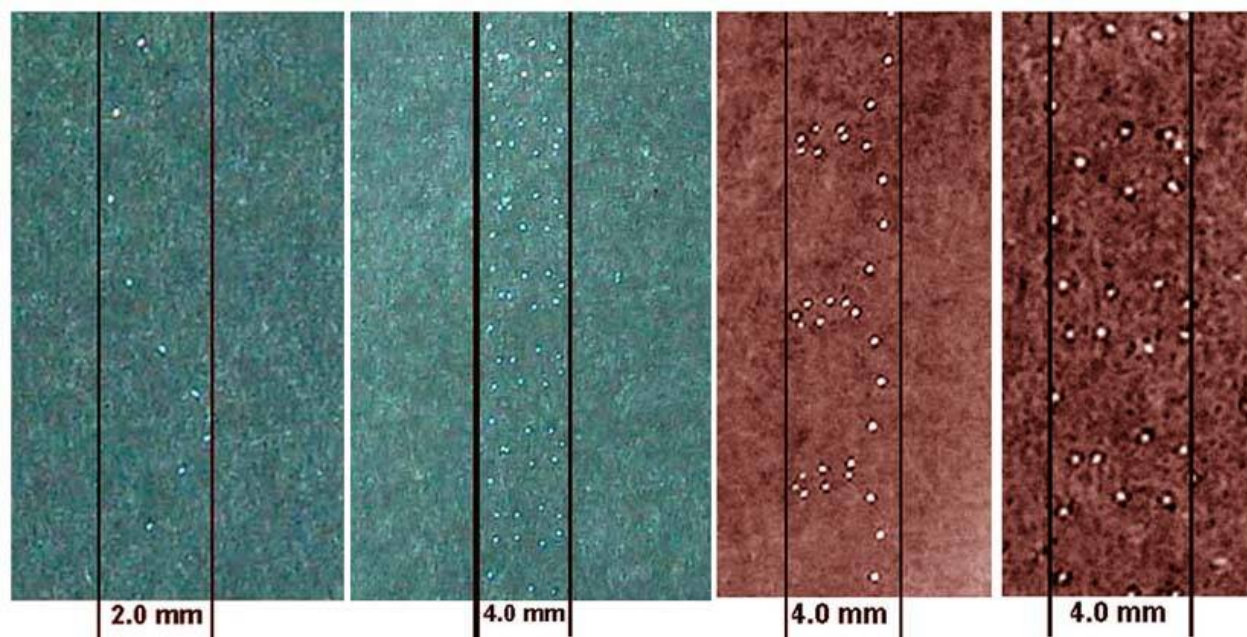
Hasta ahora se pueden perforar con el proceso los siguientes materiales en bandas :

- Papel de cigarrillos, papeles finos y en general de 20 - 150 g/m²
- Bandas de papel Kraft para sacos, papel hasta gramajes de 50 g/m² - 150 g/m²
- LDPE con espesor de 5 - 10 microns o 12 g/m²
- Vleeses, papel o sustratos revestidos con PE o PP con capas hasta 10 microns o 12 g/m²
- Laminaciones , papel – LDPE – papel con espesor de 5 - 10 um o 12 g/m²
- TYVEK, PE, no tejido, con costuras soldadas, 45 - 150 g/m², 100 - 200 microns
- Textiles, revestimientos de poliuretano y acrilato para ropa impermeable, ropa deportiva, ropas protectoras, aplicaciones técnicas tales como fltros, membranas etc.
- Non-wovens, fabrics, tissue



LPM-1 – maquina del laser micro perforacion





5. Controlado online de la porosidad o de la permeabilidad

Para la mayoría de los convertidores de papeles y de materiales flexibles en bobinas, los medios de medición de la permeabilidad a los gases son necesarios. La necesidad de la medición de la porosidad llega a ser muy evidente cuando, además, el material en bandas es sometido a procesos adicionales de nano o micro perforación electrostática o procesos de perforación con láser.

Debido a que el proceso de perforación electrostática se produce dentro de un rango de velocidades de 100 - 600 m/min y con anchos de 100 - 2000 mm, las mediciones neumáticas en línea de la porosidad del sustrato son sumamente difíciles. Además, este método de detección en línea presenta desventajas tales como tangencia de la banda, dureza de la banda, formación de escamas, acumulación de dobleces, polvos y sucios que se introducen en el sistema, fuerte no linealidad, influencia de la temperatura etc. Todos estos factores pueden influir en la precisión de la medición.

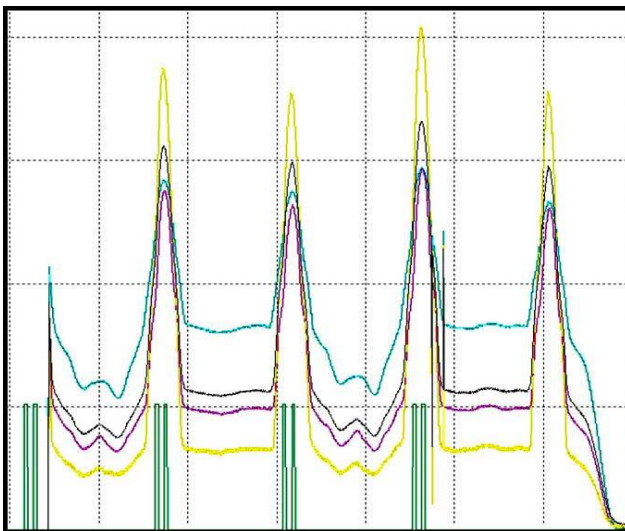
6. OPSS-1 de la porosidad

Las dificultades arriba mencionadas se superan idealmente con el sistema inmóvil óptico OPRL-1, para medición de la porosidad. También se ofrece el sistema OPSS-1 para al escaneado de una zona o de la línea superficial total, con medición mediante sensores transversales, color, línea láser y multi color, sensores de control con el CPU.

Este sistema OPSS-1 permite poder controlar bandas con anchos hasta 2000 mm, trabajar a lo largo o acoplarse mecánicamente con sistemas existentes de escaneado, con medición del peso del material y del espesor del material.

Mediante el uso de los porosímetros ópticos, el fabricante, el convertidor y el usuario final de los materiales están en condiciones de vigilar y controlar continuamente la calidad del producto y pueden mantener mediante correcciones mecánicas las especificaciones preseleccionadas.

El uso de 19" PC industrial y el elemento electrónico de potencia modular, permiten que la relación de la frecuencia o pulso de par en par de la descarga, ocurre con la velocidad de la línea y que esta relación sea mantenida exactamente. Esto garantiza un alto nivel de la estabilidad de funcionamiento en lo referente a porosidad – valor medio y variación – a todo lo anchos y en los registros de zona.



Los modelos OPRL o OPSS-1 proveen además, una certificación directa de la perforación de los materiales, de las bandas paralelas de perforaciones y las perpendiculares a la dirección de la producción, junto con un control de calidad en línea y en tiempo real durante la producción.

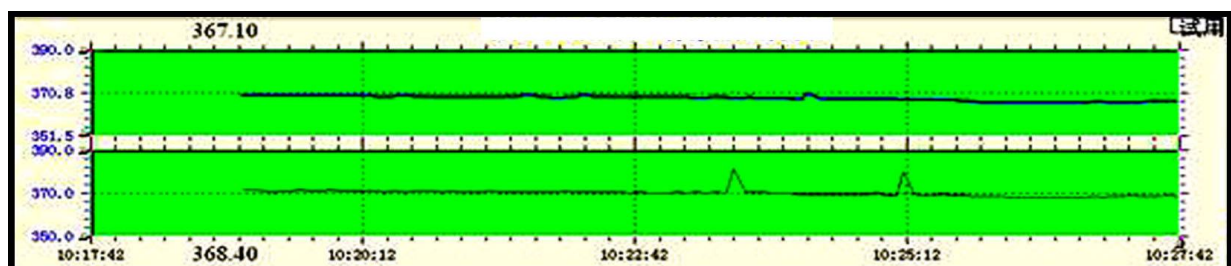
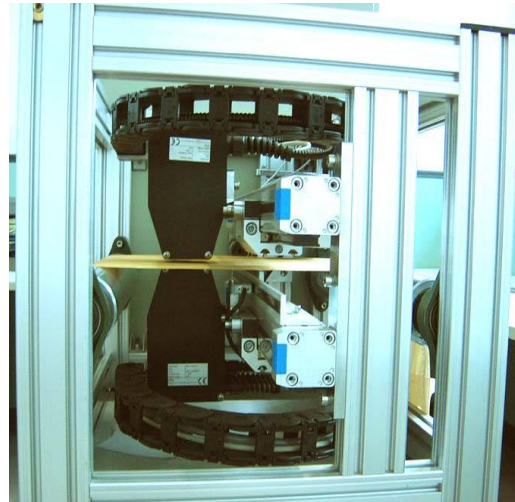
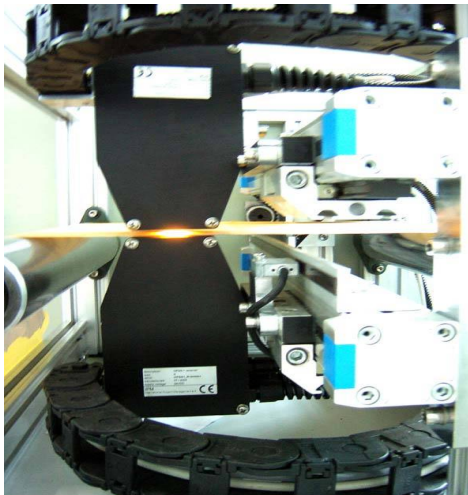
También permite al operador de la perforación mantener la porosidad requerida dentro de estrechos límites y con un rango muy bajo de variación hasta velocidades de 600 m/min, con los diversos anchos de bobina, de banda y materiales. Con la ayuda de una unidad 19" PC industrial, es posible procesar a posteriori los valores medidos y analizarlos estadísticamente. Con el sistema de medición, el operador de la máquina y departamento del control de calidad también pueden cumplir con los requisitos para mejorar la calidad con bajos niveles de producción, es decir en tirajes cortos.

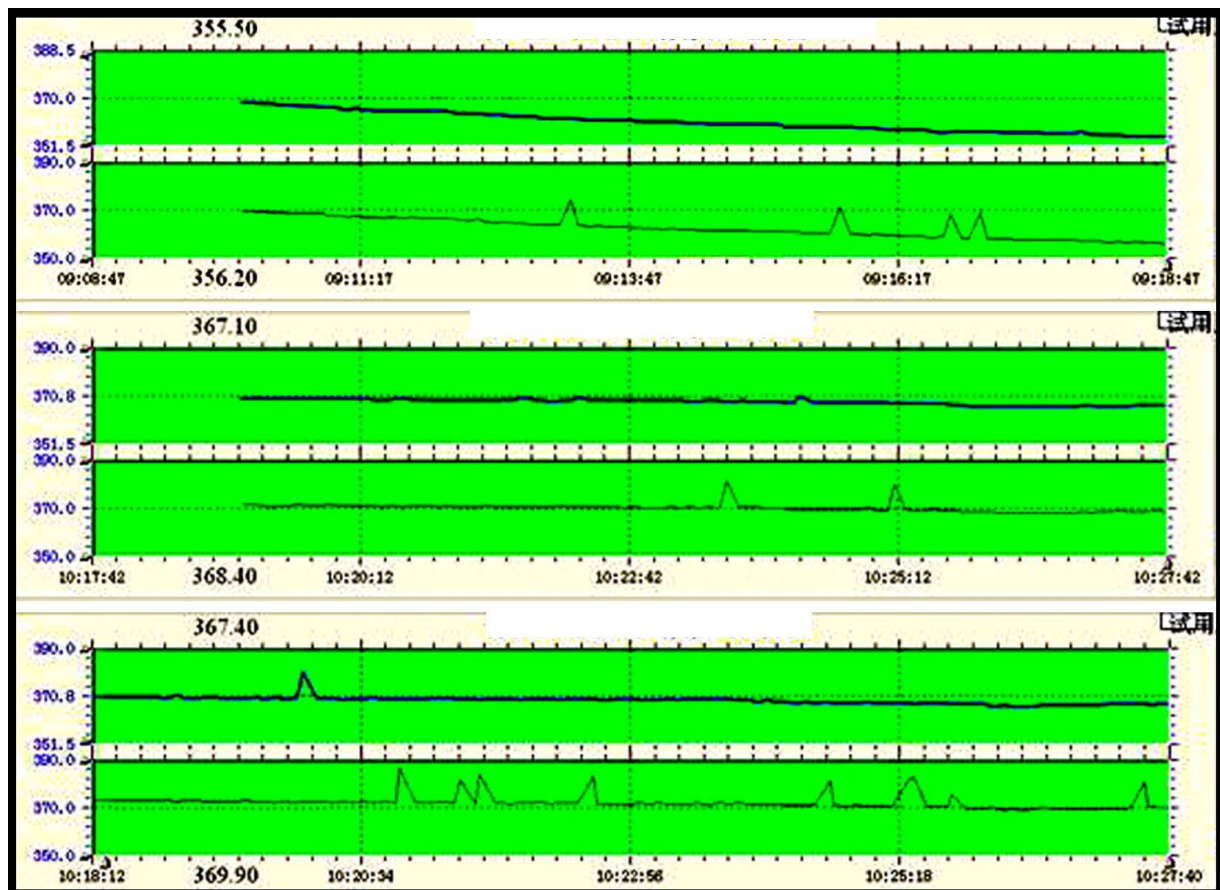
Incluso permite la certificación del producto según las normas de calidad ISO 9001, ISO 9002 puesto que registra la porosidad a lo largo de la banda y transversal a la misma. Es posible también instalar un sistema central o descentralizado con LAN para la captación y procesamiento de datos.



7. OPRL, OPSS-1 resumen

- Control óptico estático o de rastreo para las zonas, líneas, perforación electrostática o láser
- Medición controlada en tiempo real mediante opto transmisión de la zonas del material nano, micro o macro perforado
- 19" rack con equipo electronic y cassette de luz especial
- Fibra óptica en un máximo de 6 m
- Detección implementada del sensor multi color, dispersión luminosa para la compensación automática del color del material.
- Diseño, espesor , pinholes, estructura, formación, rugosidad superficial
- Calibración Automática de una sola vez del sistema de producción
- Protección contra polvo y luz exterior del sistema sobre las áreas de sensor
- Rango de porosidad 80 - 3000 C.U. – Coresta unit = $\text{cm}^3 \cdot \text{min} / \text{ml} \cdot \text{cm}^2$ - WG de 100 mm
- Ancho de la zona de perforación 2,0 - 6,0 mm
- Rango de porosidad 10 - 500 $\text{l/m}^2/\text{s}$ - WG de 20 mm – Franke
- Sistema de escaneado con una fuente de luz y dispositivo de detección a través del ancho banda
- Detección tres colores, intensidad, sobres láser de línea por la porosidad con matemáticas





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 64.8/ 68.1mm
GAP =
ZONE 2= 77.9/ 79.0mm 93.9/ 97.2mm
GAP =
ZONE 3= 111.8/ 113.1mm 123.0/ 126.3mm
GAP =
ZONE 4= 136.2/ 137.4mm 152.1/ 155.4mm
GAP =
ZONE 5= 170.0/ 171.4mm 181.2/ 184.5mm
GAP =
ZONE 6= 194.4/ 195.6mm 210.4/ 213.7mm
GAP =
ZONE 7= 228.3/ 229.6mm 239.5/ 242.8mm
GAP =
ZONE 8= 252.6/ 254.0mm
ENDZONE
READY
ZONE 1
RED= 46%
GREEN= 47%
BLUE= 72%
INTENS= 55%
LAMP= 70%
ZONE 2
RED= 43%
GREEN= 43%
BLUE= 67%

ZONE8= 348.5 CU

Command2 5
Command3

SEARCH ZONE
ZONE 1= 53.6/ 54.8mm 64.8/ 68.1mm
GAP =
ZONE 2= 77.9/ 79.0mm 93.9/ 97.2mm
GAP =
ZONE 3= 111.8/ 113.1mm 123.0/ 126.3mm
GAP =
ZONE 4= 136.2/ 137.4mm 152.1/ 155.4mm
GAP =
ZONE 5= 170.0/ 171.4mm 181.2/ 184.5mm
GAP =
ZONE 6= 194.4/ 195.6mm 210.4/ 213.7mm
GAP =
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
CU								
W	1.2	1.1	1.3	1.2	1.4	1.4	1.3	1.4
SP	27.9	23.1	32.8	23.1	32.6	23	32.5	23

产品长度 (m): 0 电机位置 347847
车速 (m/min):

CU参数: 8 PPOS1 26.9
W参数: PPOS2 276.8

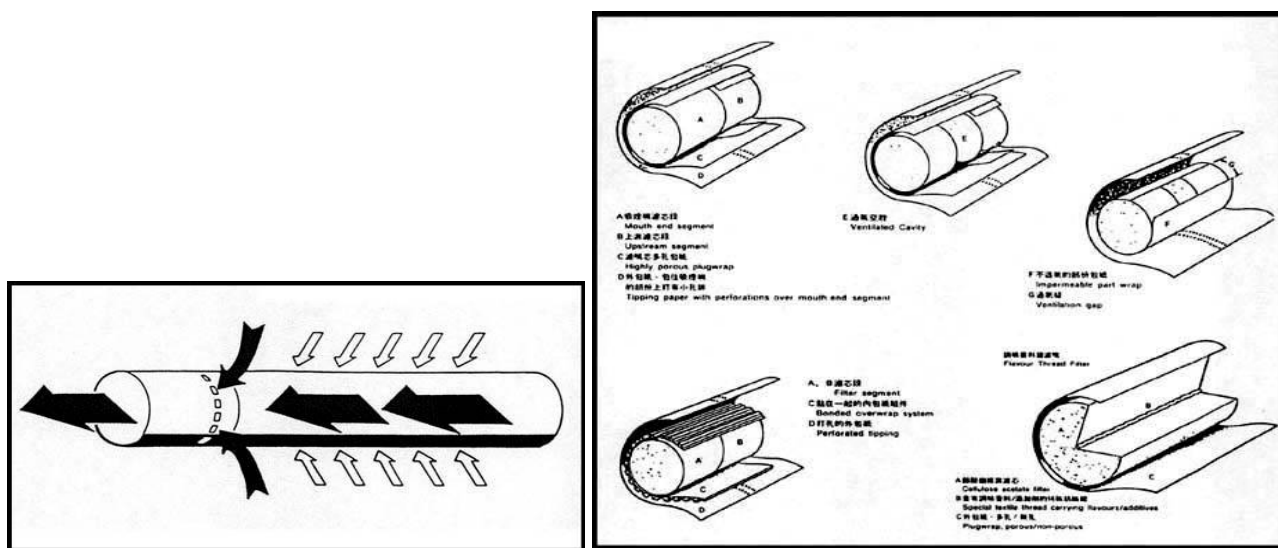
Ventilation of mass products

Electrostatic perforation has been used since 30 years for ventilation of non filter, RYO or filter cigarettes to create a directed and guided air bypass or Lindstroem principle.

For this purpose, cigarette paper for some non filter or RYO cigarettes and almost every kind of filter cigarettes tipping papers are perforated electro statically OFFLINE in zones from 2.0 – 6.0 mm width or in rows with ON-LINE or OFF-LINE by use of slow, fast flow, sealed-off or SLAB CO₂ gas or diode laser in order to reduce the harmful substances such as nicotine and condensate down to allowed values. Another effect is the possibility to control the degree of ventilation of Cigarettes.

On-line micro perforation – porosity profile

Many years ago IPM had developed a multiple online electrostatic micro perforation OESP-1 unit at cigarette making machines which was patent applied with EP0460369 and DE4018209.



<http://www.freepatentsonline.com/EP0460369.html>

The method and the device for electro-erosive perforation of cigarette paper basically operates with at least two pairs of electrodes which are ignited at the same time in such a manner that each perforation section is treated twice in order to provide a corresponding intensity of perforation, taking into consideration the duration of ignition and the web speed. In particular, the invention operates with at least four pairs of electrodes (I to IV), between which the web of cigarette paper to be perforated is moved through. The cigarette paper is moved in the longitudinal direction of the cigarette to be produced later, the width corresponding to the circumference of the cigarette plus an overlap section for bonding.

Perforating is carried out transversely to the direction of movement, that is to say an accurately defined zone section is produced around the circumference of the cigarette. The pairs of electrodes are arranged at a distance which corresponds to half the cigarette length (a, b, c) when four pairs of electrodes are used. The first and the third pair of electrodes are ignited simultaneously. A distance-dependent control causes the second and fourth pair of electrodes also to be ignited simultaneously when the previously perforated sections have traveled the distance of half a cigarette length.

Each section is perforated four times, the speed at which the web can be moved being determined not by the spacing (half a cigarette length) of the pairs of electrodes but by the spacing of the pairs of electrodes in each case simultaneously ignited (one cigarette length). This provides for uniform, intensive and very powerful perforation and the cigarette paper treated can be continuously supplied to the cigarette machine for further processing in the longitudinal direction of the cigarette.

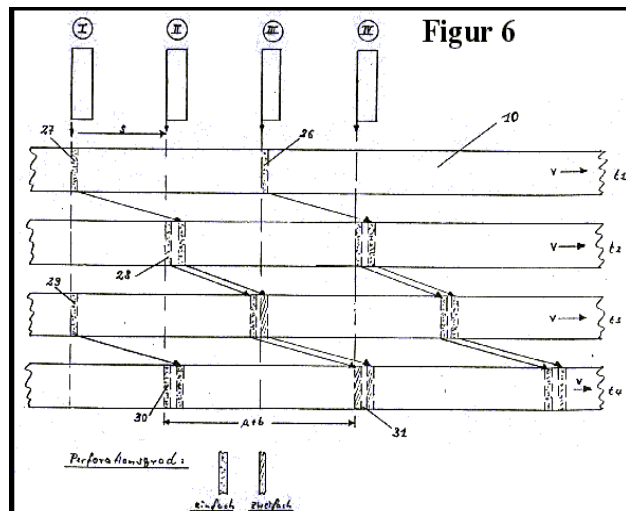
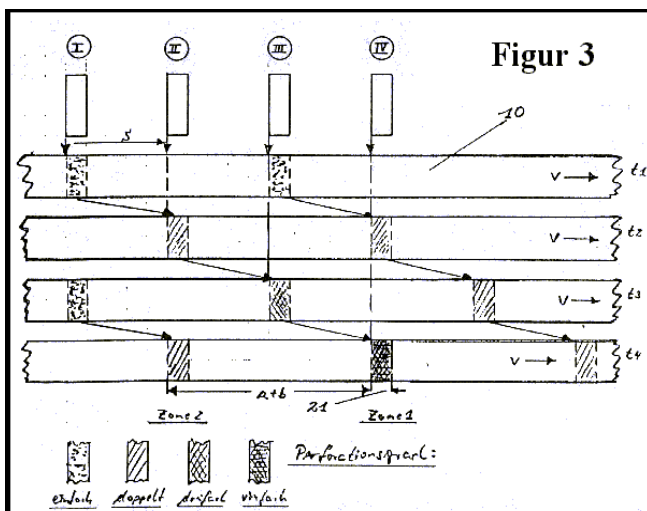
That electrostatic micro perforation process enables cigarette or tipping paper while cigarette making processes to reduce nicotine and condensate levels for non-filter and filter cigarettes as well.

The OESP-1 devices opens fully new possibilities for cigarette or tipping paper ventilation during cigarette manufacturing by entire perforation cassettes integration into cigarette making machines as Max-S, Protos 80, 90, MK9, G.D.

Advantages during manufacturing

Compact all-over-dimensions, direct mechanical integration of perforation units, easy functional interfacing and full EMI acceptance in order of CE, EN, NEC, CCC standards archiving high production efficiencies with controllable ventilation grades on highly automated cigarette making machines.

- Patent granted, powerful dual high frequency switching electronics multiple perforation performances of the circumference of each cigarette enables problem less perforation on high-speed cigarette making machines up to 12,000 cpm
- Porosity ranges from 50 up to 400 C.U.
- pore densities from 25 up to 300 pores/cm²
- hole size from 30 up to 80 micron
- cigarette ventilation grades up to 55 % are archive able.
- All necessary perforation, production parameters are stored and controlled by microcomputer operation, geometrical and synchronized positions of perforation lines, zones etc., pore density, perforation zones width and distributions, perforation profile and porosity ranges for each cigarette brand
- **Porosity profiles over the length of each non-filter cigarettes are possible.**
- Furthermore single, multiple, different or equal groups of single perforation zones around the circumference of each cigarette for non-filter, RYO even tipping paper for filter cigarettes are possible.
- All stored parameter sets are linked to the PLC system.
- Different micro perforation designs and porosities of each cigarette brand are flexible to define and controllable during all production processes.
- Air ventilation levels are exactly defined and, due to on-line feedback, can be kept constant by means of perforation system design and porosity distribution.
- For non filter cigarettes for example, perforation can be effected over the entire length and circumference of the cigarette.



Liability and system investment

The ESP process OESP-1 has a high liability and is realizable with low investments and low running costs when compared with on-line macro or micro laser perforation processes.

An on-line porosity control system OPSS-1 monitor continuously the air permeability, called optical on-line porosity vision or porosimeter, with a state-of-the-art technology to obtain a close-loop and feed-back to the perforation unit to keep ventilation grades constant.

Conclusion: On-line micro perforation processes are possible to use for other mass products and application fields with full system integration in entire production lines as bag, sack, packaging manufacturing, etc.

ON-LINE LASER PERFORATION with patent granted high speed twin level multiplexer DE102004001327

A – laser source and IPM patent granted multiplexer with 8 optical channels

- 8 laser lines, 10.6 μm , CO₂, sealed off laser, $M < 0.9$, e.g. Coherent ULR-300, 300W Synrad, PRC
- 4 laser lines, 10.6 μm , CO₂, sealed off laser, $M < 0.9$, e.g. Coherent ULR-150, 200W Synrad, PRC
- laser source dimensions all over approx: 1100*200*200 mm, water cooled
- output 45 degree divert mirror
- IPM multiple laser beam multiplexer
- center rotate twin beam splitter and high speed motor (not shown) up to 900 rpm/sec.
- diameter approx. 400 mm, high approx. 200 mm
- 8 optical output channels, coupled special flexible hollow fiber, each in lengths 1,000-3,000 mm

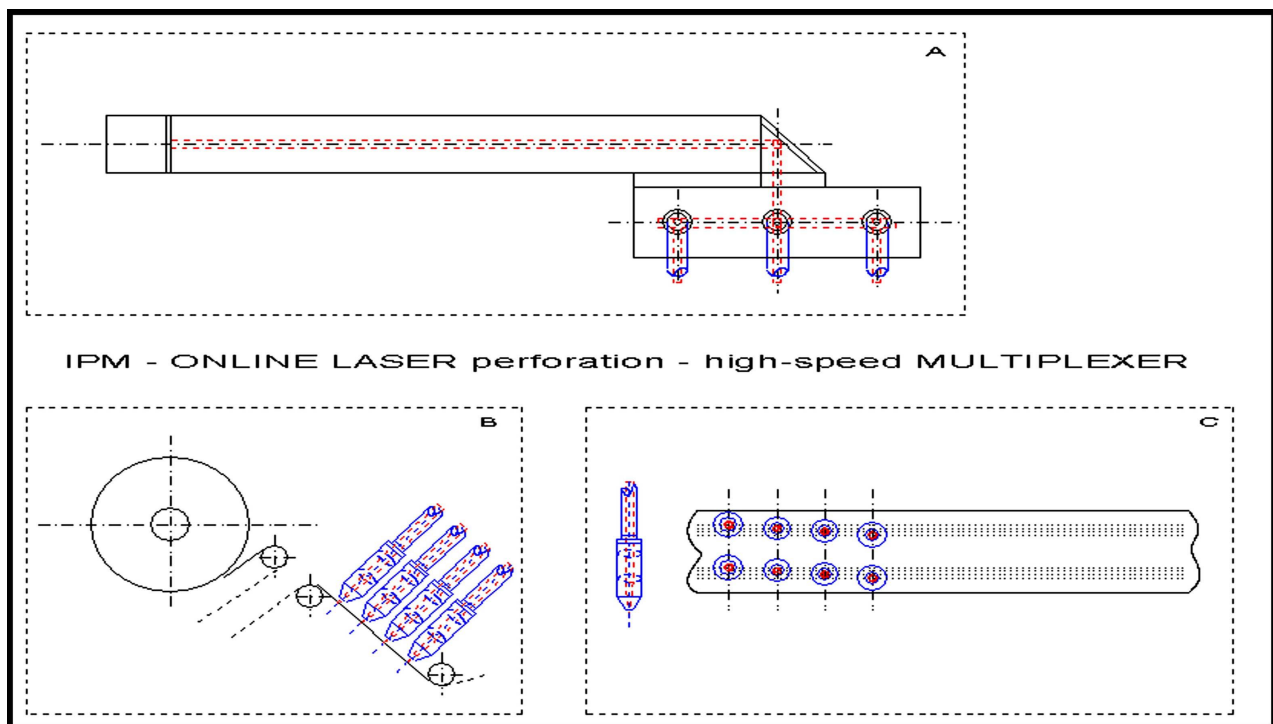
B – bobbin unwind and perforation heads

- tipping paper from 48 up 64 mm web width
- 8 perforation heads, 4 on each side
- each laser beam supply with special hollow fibres and auto focus devices
- diameter of each focus device around 25 mm, distances in web direction around 50 mm
- length of necessary perforation section approx. 200 mm by 8 laser lines
- necessary width of perforation section - tipping paper width + 40 mm on both sides

C – tipping paper strips with 8 laser perforation lines

- up to 10,000 cpm or 135 m/minute tipping paper web speed
- 4 laser perforation lines on each side
- total round or oval hole sizes between 60-180 microns diameter
- up to 8 holes/cm, one hole with e.g. 14 C.U.
- 8 h/cm*14 C.U./h*4*2cm (Coresta) = in total around 900 C.U.
- ventilation degree 10-80% with twin or quad rows
- by 8h/cm*8 holes/rows*135 m/minute = 14,440 holes/s in total

further information on request



IPM International Perforation Management

IPM se fundó a principios del año 2002 para ser una industria proveedora, de acondicionamiento y de papel fino con innovaciones, en especial con máquinas de nano y micro perforación electroestática, láser y sistemas de control óptico online punteros en los sectores del mercado mundial del tabaco.

IPM es una empresa de ingeniería de alta tecnología que, con un equipo de técnicos e ingenieros especializados, desarrolla máquinas de perforación y técnicas porosimétricas ópticas online para hojas continuas en Alemania, China y Tailandia, donde las fabrica con socios autorizados que aportan soluciones, las vende a escala mundial y las transfiere a los clientes potenciales como proyectos llave en mano. La formación, instrucción y la transferencia de tecnología necesaria para el personal técnico y de producción son un elemento esencial del volumen de suministro y de la cooperación.

Werner Grosse, fundador de IPM es, desde 1979, ingeniero de aplicación y desarrollo y director del departamento de aplicación internacional de técnica porosimétrica óptica y perforación electroestática en la industria de acabado del papel y de tabaco

En el marco de esta actividad y gracias a numerosos contratos de estudio, creó más de 46 ingenios y patentes, muchos de ellos reconocidos y registrados con patente nacional e internacional. Gracias a ello, y unido a las características especiales del producto para hojas continuas con perforación de alta precisión, se desarrollan y comercializan a escala mundial nuevos procedimientos de acabado, tecnologías de perforación, sistemas métricos ópticos online y máquinas de producción.

En 1991 comenzó a trabajar por cuenta propia, lo que dio lugar a la creación de GmbH en el año 1993. Con ello se relaciona la expansión en el mercado internacional de la técnica de perforación electroestática hacia otros campos de aplicación - papeles filtrantes, de saco, de bolsa, non-woven, tela no tejida spunbonded, telas, papeles revestidos y papeles Kraft - para la industria de acabado del papel, de elaboración y especialmente de embalaje.

GmbH pertenece desde 1994 a grupos de proveedores internacionales de la industria del tabaco. Tras muchos años como socio y gerente, Grosse abandonó la empresa a finales de 2001 para desarrollar nuevas líneas de innovación con IPM International Perforation Management y, en estrecha colaboración con nuevos clientes relativamente importantes, implantar en todo el mundo las técnicas de producción.

Además de su actividad y compromiso como innovador, ingeniero y empresario, es miembro de instituciones nacionales e internacionales que persiguen objetivos de innovación, de ingenio, de derecho de propiedad internacional y federal y que practican un intercambio de información técnica y económica a escala internacional.

A éstas pertenecen entre otras DABEI S.A. Deutsche Aktionsgemeinschaft Bildung, Erfindung und Innovation y Deutsch-Chinesische Wirtschaftsvereinigung DCW Agrupación comercial germano-china.

En el sector de la técnica de la micro- macro perforación, de la técnica porosimétrica óptica online y como miembro de diferentes instituciones ha publicado un sin número de artículos especializados y conferencias en alemán, inglés, español, francés, italiano y chino.

En las webs

<http://www.microperforation.com/engpublication.htm>

<http://www.microperforation.com/germanpublication.htm>

existe una relación de sus publicaciones, invenciones y patentes con títulos y fuentes.

Desde 01-2002, las publicaciones y patentes aparecen publicadas en

<http://www.microperforation.com/germannews.html>.

Grosse recibió del Gobierno de Yunnan el 19-10-2004 la distinción Caiyun para galardónarle con el título de Experto extranjero en tecnología por las tecnologías de innovación, transferencia de know-how, técnicas de producción y exitosa colaboración en el sector de la perforación láser electroestática y sistemas de proceso de porosidad ópticos online en colaboración con el grupo Hongta de China.

Honor China Government Yunnan

- <http://bfe.yxrs.gov.cn/article.asp?id=2005092011030968>
- <http://www.tobaccochina.com/news/data/20038/c815083548.htm>
- <http://tobaccoreportermagazine.com/china/2004/Dec04China/Industry%20Briefs%201204.htm>

Portfolio - IPM International Perforation Management

IPM is a personal engineering and manufacturing company, based in Recklinghausen Germany and Asia. With international specialized engineers and competent partners in Germany and China we design tailor-made, manufacture, install, commission electrostatic micro cluster or laser perforation systems and machines for fast moving paper webs or other material treatments 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 measurement 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 micro 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 and build 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, particular 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>

<http://www.tobaccochina.com/news/data/20038/c815083548.htm>

<http://tobaccoreportermagazine.com/china/2004/Dec04China/Industry%20Briefs%201204.htm>

IPM and his engineer team operating as technology experts with project managements in the tobacco, cigarette making, supplier, paper converting, packaging, printing, material treatment and other hi-tech industries.

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

Twin bobbin or high automated wide web laser perforation machines are design and build together 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 20-180 g/m², thicknesses from 10-80 microns, up to 20 g/m² LPDE coating are perforate electro statically 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 grant 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 100-2,000 mm at web speeds up to 600 m/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, flam, micro needle or laser perforation are not feasible, large pore sizes, low pore density, very expensive or simply uneconomical would not allows successful product application.

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

- breathable, micro ventilated mass products, cigarette, tipping, filter, packaging, plug-wrap, 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, comfortable 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 100-1,000 mm, by web speeds up to 600 m/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 grant 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 400 m/min, flexible web width up to 2,000 mm by up to 2,500,000 holes/sec.

Jumbo roll-by-roll production, on-line 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, micro machining, 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 8-14 mm 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 holes and holes 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, international property 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 off-line 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 grant as DE10328937.

On-line porosity sensor scanner measurement

Patent pending DE10251610, patent grant 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 20-500 mm per second, flexible material web widths up to 5,000 mm, measuring gaps 2.0-5.0 mm, in-line 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 30-160 g/m², web width 50-2,000 mm, 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 2.0-6.0 mm, surface-all-over perforation up to 2.5 Million holes/m², up to 16,000,000 holes per second by web speeds up to 500 m/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 grant 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 300 mm, speeds up to 600 m/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 grant 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 2,000 mm, feedback of each perforation zone, porosity with multi colour sensor, zone and line position control, accuracy of 0.1 mm with precise laser line unit, sensor controller firmware, RS-232 serial link up to 230,400 Bit/s, RS-422, Ethernet, USB, industry PC, C++, process visualization, quantity, quality, statistics, link to PCC/QCC. Patent pending DE10251610, China patent grant 200310104764.

IPM business

Technology expertise, consulting, support, improvement, modification, overhauling, hi-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, on-line porosity sensor scanner systems for complete 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 fibres, 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 grant 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.

Press release example

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>

main link <http://www.microperforation.com/ipm-technology.html>

Patent references

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