A NEW TECHNICAL CONCEPT PRODUCING OFFSETPLATES

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Introduction

Offsetplates are in a great variety on the market. Different types concerning raw material, use, price, plate surface, coating and treatment are available.

The quality of a modern offsetplate is based mainly on the printability and runability characteristics of the plates, related to the price.

Is this ratio in order, three factors are of great influence for an offsetplate and are also the basic technical concept for this new plate technology.

1. Topography and surface quality of the plate

2. Coating characteristics of the plate

3. Ecological, economical and recycling parameters during the production

Point 1 and 2 are necessary for the runability of a good offsetplate which implements high copy numbers and high speed.

Furthermore point 1 and 2 are also determining the print quality.

Offsetplate can be characterized as follows:

- kind of print image (positive, negative).

- material of ink receptive parts coating, metal (copper, aluminium) or lacquer.

- material of the non printing area:
  matal (Al,Cr) silicon or special surfaces for duplicators.

- used coatings:
  Diazo/photopolymers, bichromat or photo-receptors. For duplicators there are also silver salt coatings available.

- kind of handling:
  You can differ between direct or indirect treatment.

- kind of coating.

1. PLANT LAYOUT

The modular design allows the universal use of the plant in 3 ways:

A. Sheet fed production
B. Endless production up to a width of 1325mm and a length of 1610mm
C. Recycling offset plates in a production line

1.1. DESIGN OF THE PLANT (see figure 1,2 Appendix)

The construction of the plant is as follows:

1.1.1. Feeding unit special design for sheet fed, endless and recycling

1.1.2. Degreasing unit for eliminating the rollskin and for technical pre-treatment

This is done by alkali with inhibitors against pitting or roller structure marks. The degreasing agent is producing a regular grain up to 3u and eliminating the rolling skin, without leading to roller structure. Treatment is with hot solutions under spray pressure.

1.1.3. Washing I

It is done by a reverse flow process with slightly acid water under pressure.

1.1.4. Mechanical graining part

Sand wet brush graining is used with achieved plate surfaces from 2-6 micron Rt producing a smooth texture with irregularly painted grains.

1.1.5. Washing II

With slightly acidified water in reverse flow under high pressure to wash the brushed aluminium surface. The graining agent is thus eliminated into a precipitation tank, then to the plate degreasing process.

The process concentration of the degreasing solution contains same residue quantity of pH 2,5. It does not influence the pH value of 6,5 of the waste water.

1.1.6. Departments for anodic tampon oxidation or for currentless oxidation and/or silicating

1.1.6.1. Tampon oxidation

This method is using rotating tampons and is reducing the oxidation time to 1/20 and yields at least astonishing results.

In comparison to the electrolytical diving oxidation process the energy consumption of both systems is equal but tampon is 20 times faster.

Therefore the space requirements are quite smaller. Also the oxide layer is quite harder and the porosity of the surface higher as you can reach by normal electrolytically oxidized plates.

These facts are very useful to get better adhesion of the coating and also a better quality and durability of the plate.

The oxidation is done with H3PO4 and some special additives to reach these results.

1.1.6.2. Currentless oxidation

Oxidation is executed in a warm solution with a special chemical recipe.

1.1.6.3. Silicating

Silicating is done in an alkaline solution.

1.1.7. Washing III

This washing process is divided in two parts Washing and/or substrating.

1.1.7.1. Washing

After squeezing-off of process water, final washing of heated sheets in demi-water, the squeezing-off operation and transportation of sheets into the drying unit follows.

1.1.7.2. Washing and substrating

Substrating is using a special component producing a monomolecular film that is immediatly reacting with the fresh aluminium oxide to serve as an intermolecular bond with the sensitized coatings resulting after drying, independently of whether organic or water solutions will be used.

1.1.8. Conclusions

The technology allows the complete and perfect plate surface for all sensitized coatings.

A substrate surface freed from sensitized coatings becomes a durable hydrophilous quality through gumming or fixing.

The most important step in this new concept is the use of an organic chemical (formula is known but not free for publication) to build a monomolecular layer between the aluminium grain surface and the coating.

A currentless silicated plate surface can be used without problems for printing runs up to 50.000 copies.

A currentless oxidated plate surface yields a perfect result in runs of up to 100.000 copies even for rotary offset printing.

An electrolytically oxidated plate surface is suitable for runs up to 500.000 copies (positive and negative). Rotary offset runs up to 300.000 copies.

1.1.9. Cooling section - approx. 1m

1.1.10. Cabinet for electrostatic coating

The thickness is from 0,8 to 1 micron or more at reduced speed according to the technological requirements.

Security margins are considerably higher, as far as lowest and highest explosion saturation points are concerned.

The application in demi-wash water, without any intermediate treatments, of a special organic-inorganic coating by nozzle spraying onto a surface with a chemical pre-graining only, is highly adventageous, its thickness being determinated by means of a spiral ductor. This coating is very similar to the lithographic stone structure.

It is a perfect base for all types of sensitized coatings and endures runs of up to 100.000 copies.

This type of coating is capable of producing a printing plate of a perfect quality and for a perfect printing technique also with PE or Sytosil waterproof paper and PET transparencies (i.e. non-metallic products).

1.1.11. Climate Cabinet

1.1.12. Drying

Infrared radiators with adjustable wave lenght from 2,8 to 14 micron.

The infrared dryers are also adjustable in focus. 4 sections with 2m.

1.1.13. Cooling section II 2m

1.2. AVAILABLE COATINGS AND RAW MATERIALS

1.2.1. Aluminium

In the quality hard or 3/4 hard.
Thickness 0,15/0,2/0,3 mm.

1.2.2. Coatings

The plant is capable for producing negative and positive as well as plates for mat mounting transparencies, with any type of sensitized coating also electro-photographic coatings and negative coatings based on bichromate sensitation.

1.2.3. Light sensitized coatings integrated into the machine technology:

1.2.3.1. Diazo sensitized coating with acid-hardening resins on oxide surface:

Runs as high as the durablitiy of the metal permits. Alkali developing, fixing and/or fountain solution hardening. UV colour resistant.

1.2.3.2. Diazo sensitive coating for normal applications:

With low molecular diazo as sensitizer.

1.2.3.3. Inversion sensitized coating with special diazo:

Developable positive to positive or negative to positive. Aqueous developer in both cases.

Note regarding all sensitized coatings:

The sensitized coatings have a minimum shelf life of 5 years, include a secondary radiator, are intensively coloured and have an enormous contrast after development. Immediate receptivity in the machine.

1.2.3.4. New organometallic sensitized coatings:

These are newly developed sensitized coatings, mostly aqueous developing, that are permitting printing plates to be photographed in camera by means of metal halide lamps, within the time needed to produce contact copies of diazo coatings.

The reproduction quality is around 1 u lines and is especially suited for chips and microcircuits.

These coatings allow even direct additive copper plating of the circuit components.

1.2.3.5. Negative diazo polyepoxide sensitized coating:

Aqueous developing, well suited for very high printing runs on all metall and plastic surfaces.

1.2.3.6. Conductive negative sensitized coating:

For subsequent all-purpose metallization (printing or electronic). Aqueous developing.

1.2.3.7. Negative coating with special diazo:

Aqueous developing, with subsequent acute IR hardening in the developing machine immediately after developing/drying.

Note: All systems are suited for rotogravure conversion, printing plates may be pre-sensitized.

1.2.3.8. Special sensitized coatings developed for a electrophotographic coating:

Aqueous or lacquer solutions for all transparencies, aqueous developing and camera usable.

1.3. OVERALL CONSIDERATIONS

1.3.1. Advantages of electrostatic coating

The comparable roll coating is quite more expensive because the apperatus has to be very sophisticated. Also the contact coating has to consider regeneration problems for the coating rollers.

Furthermore thickness variations of the aluminium are causing coating variations. Big problems for exposure are arising.

Electrostatic coating is used with a 20% positive or a 5% negative solution H2O and/or organic solutions can be used.

Sensitized coatings with a short potlife can be processed without disadvantage and problems (Diazo is 10 times cheaper than ester-diazo and the stability in storage is lasting years).

A pre-drying of the plates ensures that the lacquer coating coagulates off the backing and that the solvent vapour is not effecting the lacquer surface. The temperature is adjusted to the evaporation curve of the solvents.

1.3.2. Graining advantages

It shows clearly the advantages of a surface treatment method having a graining speed that is 4 times faster and needing only a fraction of the electric energy as compared to other methods.

The product of an average aluminium abrasion amounts to 4,2 g/m2 water-soluble and soil damaging aluminium salts. To obtain the necessary quality, current consumption is 2,5 kW per 1 m2.

With the Imprinta technology, abrasion and aluminium graining amounts to 0,132 kW/m2, including washing and drying.

In any case, this concept is proofing that this technology increases the production and protects the environment more than any other method known today.

2. ENVIRONMENT ASPECTS

There are already companies buying used plates for the sole purpose of regenerating especially in Japan.

But this aspect is only one environmental factor discussed in this chapter.

2.1. VENTILATION AND DEAERATION

Special units producing and controlling the overpressure in the spray booth and drying tunnel are foreseen. As far as compressed air is required a compressor with air dehydration is

installed. Also air conditioning for both, the spray and operating boothes is being supplied.

Ventilation capacity is 1.200.000 lt/h, identical with the deaeration. Escape of solvent is 7.200 ml/h methyl glycol.

According to SUVA prescriptions, the max. solvent content of the exhaust air is set at 25 cm3/m3 air. In consequence the air pollution in the process is less than 25% of the allowed quantity.

2.2. WATER AND WASTE WATER RECYCLING

Water installations with all necessary filters and the demi-water installations can be individually adjusted.

Waste water outlets are technologically integrated into all processes. Heating and cooling elements for water and process solutions are attached to the plant.

Water in reverse flow for cooling and wash processes about 150 lt/min. This amount of water allows dilution of all waste material to less than 0,001 g per liter.

Neutralisation or decantation in the last phase in done by NaOH wash water out of the degreasing process. Hot water is up to 90 degree Celsius and can be taken from the normal water supply. The need of demi-water is 2 lt/min.

In a second stage a reverse flow acts as cooling water for the electrolytically oxydated plates in the 3 oxydation aggregates. The washing water carries 1,2 g electrolytic solid residues per minute with a 1,5 pH value per liter therefore is a saturation of 0,0008% concerning the electrolyte. This water washes also the brushed aluminium surface.

The washing water is then conducted into a precipitation tank and then to the plate degreasing process.

Concentration of the degreasing solution contains the same residue quantity of an pH of 2,5. It does not influence the pH value of approx. 6,5 of the waste water.

An 8 hour working day is consuming approx. 9 m3 process water and 120 liter demi-water.

2.3. RECYCLING OFFSET PLATES

This procedure is well known for decades. This technology reduces the process time to 15 sec. that prevously has been 30 min. per 1 m2 and you get a considerably better and more standardized grain. The practice has shown that a consequent regeneration of used plates is saving first of all money and also raw aluminium and therefore also a lot of energy. A recycled plate does not differ from a new plate as far as appearance, repro- and printing qualities are concerned.

3. PLATE AND PRINTING CHARACTERISTICS

First of all I like to list some technical figures about the presensitized offset-plates available as positive, negative and reversed plates.

- high copy numbers up to 300.000 without baking
- resolution 4 - 6 um
- 50% less water during printing because of the monomolecular, hydrophilous intermediate layer.
- coating is resistant against all solvents
- exposure time of positive plates 35% and negative 75% reduced
- 35% shorter developing-time for negative plates in aqueous medium
- the coating is working linear proportional
- high contrast of the coating
- special treatment of the coating is eliminating stripping edges after exposure
- recycling at least 4 times

Universal positive/negative sensitized coatings are developed alkaline or slightly acid/aqueous.

Reproduction is in both cases for 1% dot size and also for 99,5% halftones possible. Negative sensitized coating coated as lacquer, developed in H2O. Additional hardening is happening during developing. None of the offered types of sensitized coatings need a thermal treatment.

One big advantage of the plate is that the difference between proof printing and printing plate can be eliminated only by the exposure time.

Dot gain can be reached exact proportional as can be seen in the figures about the characteristic curves from the coating derived by different exposure time. Also ink receptivity is enormous at least during proof printing already the second print can be used. Built-in secondary radiatores eliminate the film edges without any unwanted reduction of fine lines or fine dots through rising exposure time. The protection against dot size reduction is integrated in the sensitized coating.

Platemaking figures for positive plates coated with diazo are:

For testing was used:

Automatic Kalle frame KR 588, 5000 W, metalhalid lamp, lamp distance 135 cm.

Test wedge UGRA/EMPA for plate characteristics, standardized developing.

Exposure time 10,20,30,40,60,80,120 and 160 units (1 unit approx. 1 s).

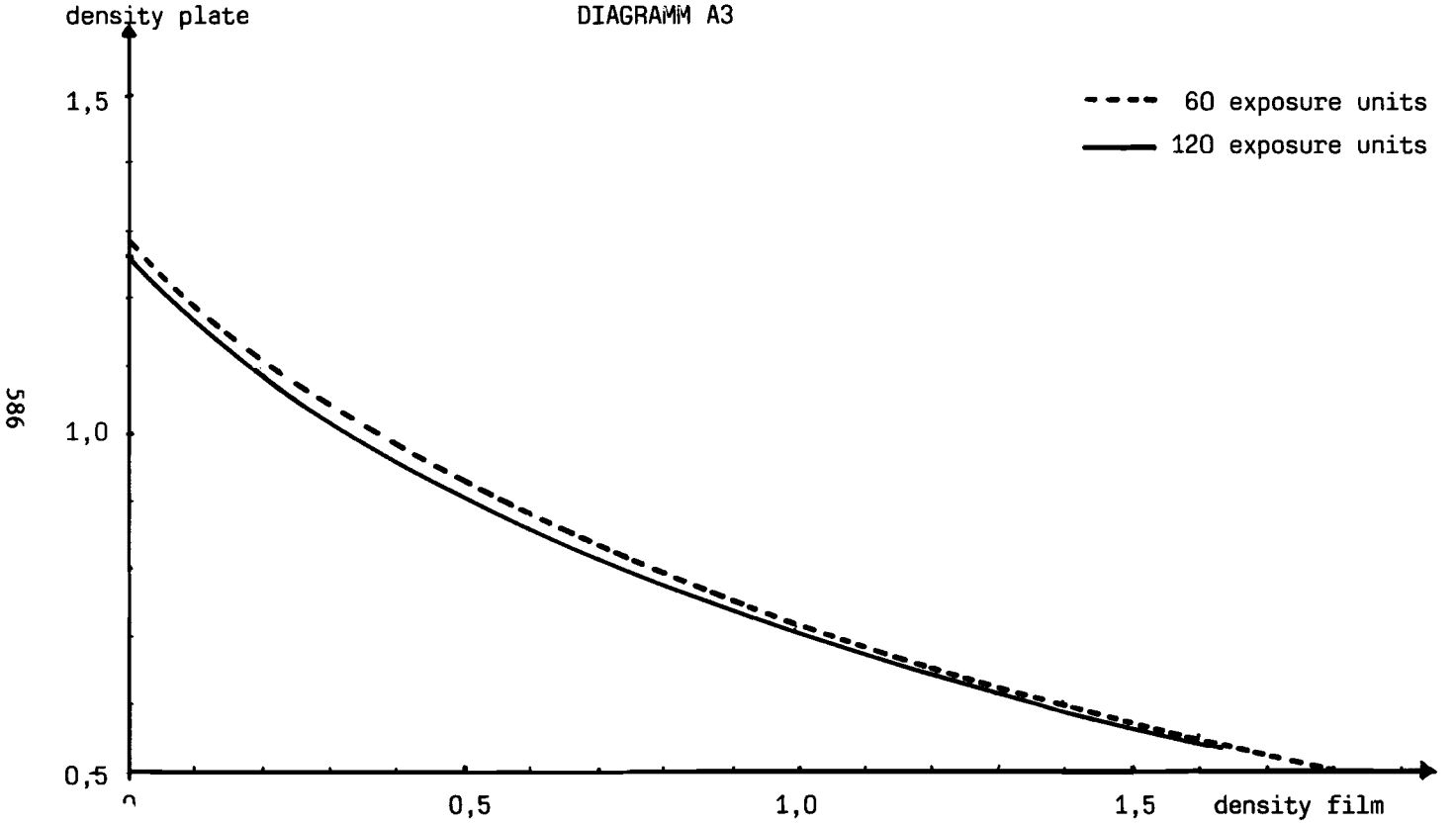
The plate was judged by 50 x enlargement.

Judged were the continuous tones, microlines and high light dots in respect of resolution, minimum exposure, standard exposure and exposure limits. Also the plate surface was determined with a Perthometer.

resolution	4 - 6 u
exposure min.	20 units
standard exposure	80 units
exposure limit	40 - 140

Examples can be seen in the appendix.

APPENDIX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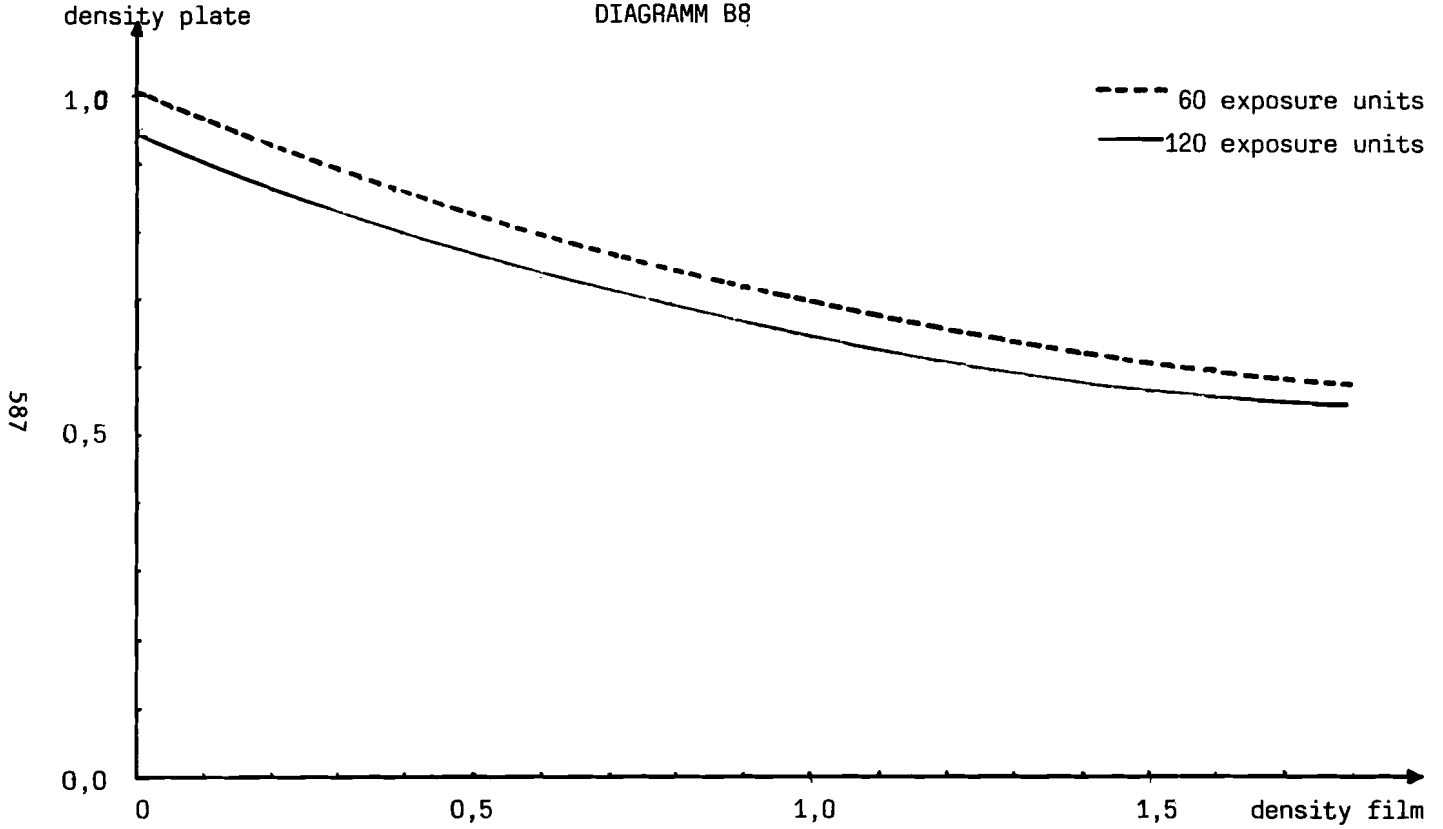
density film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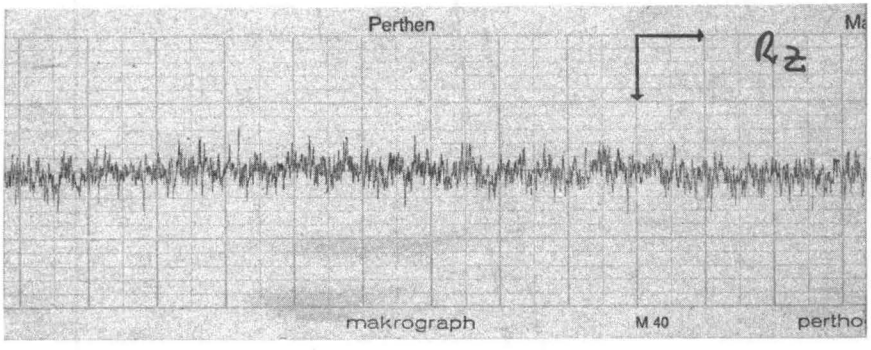
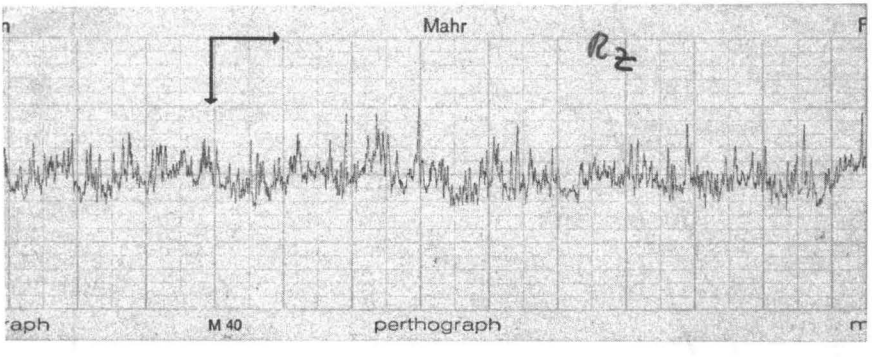
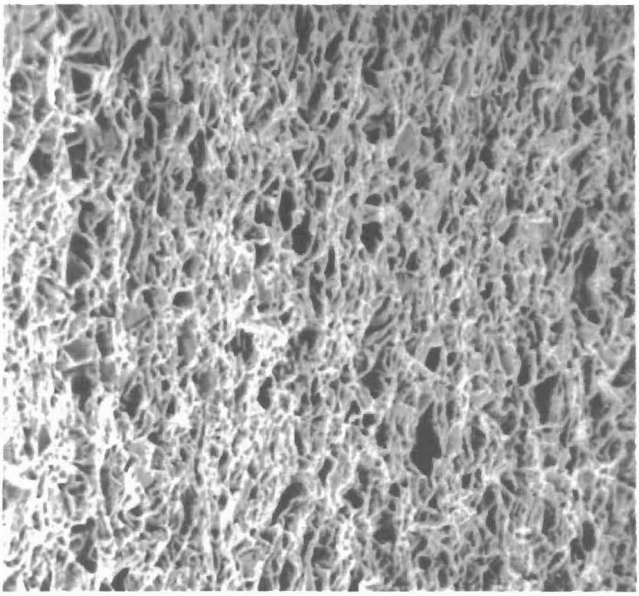
PERTHOMETER

ONE DIRECTION



OPPOSITE DIRECTION





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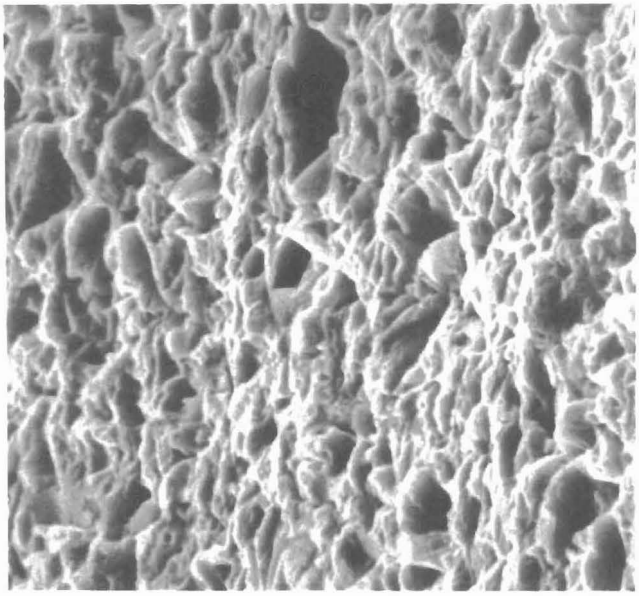

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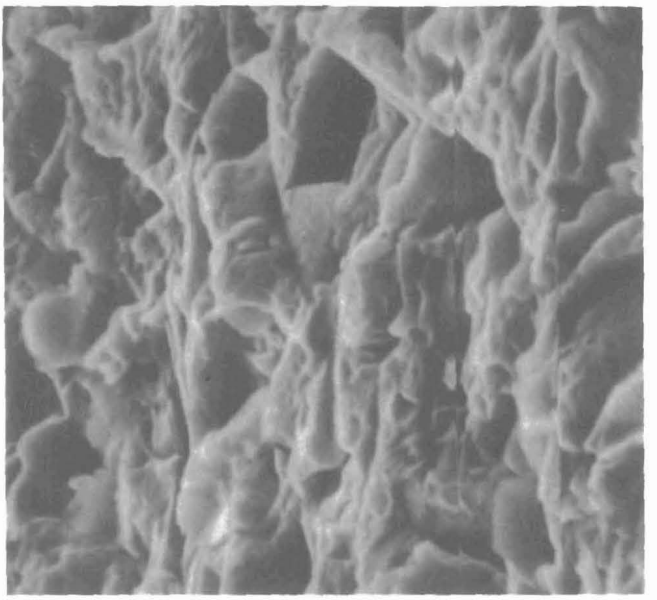

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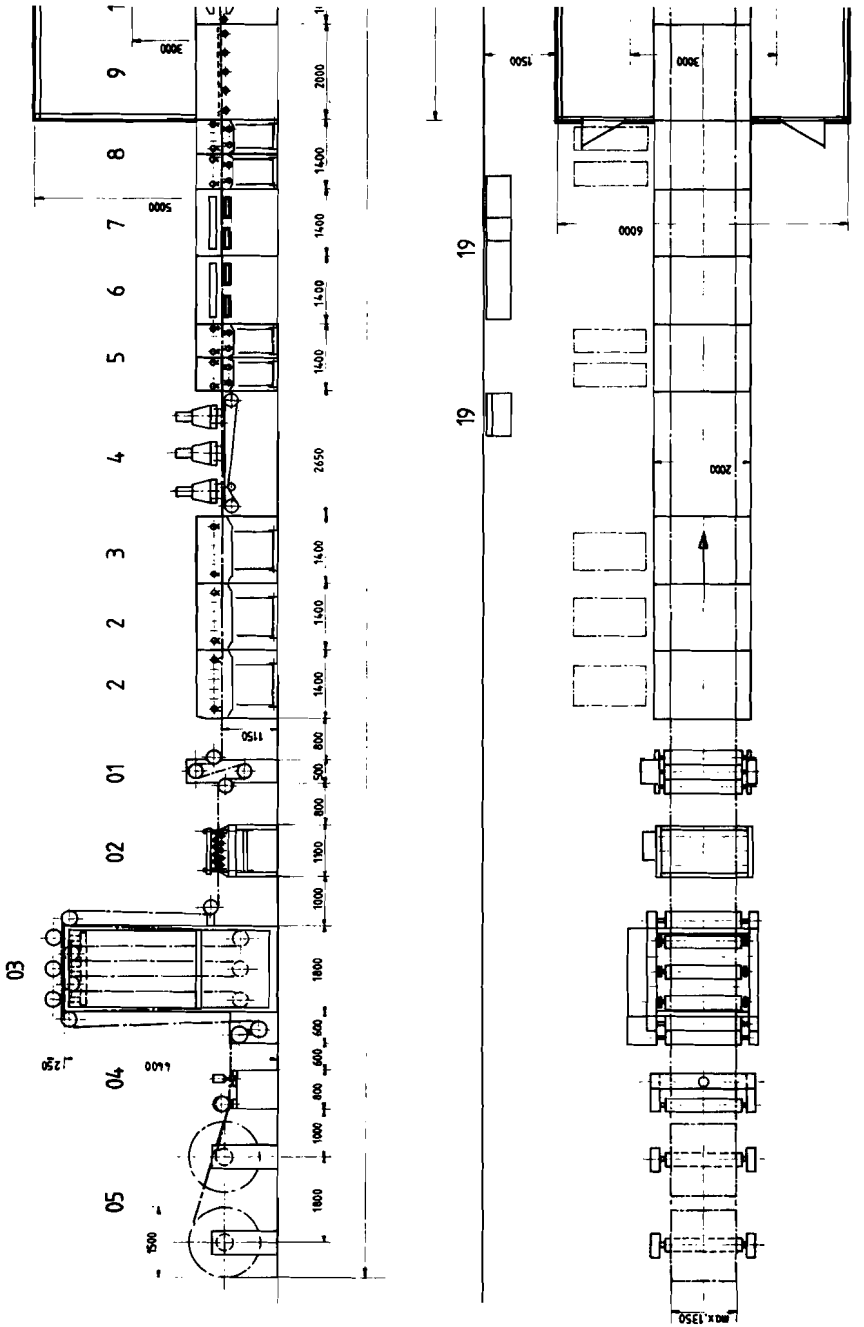
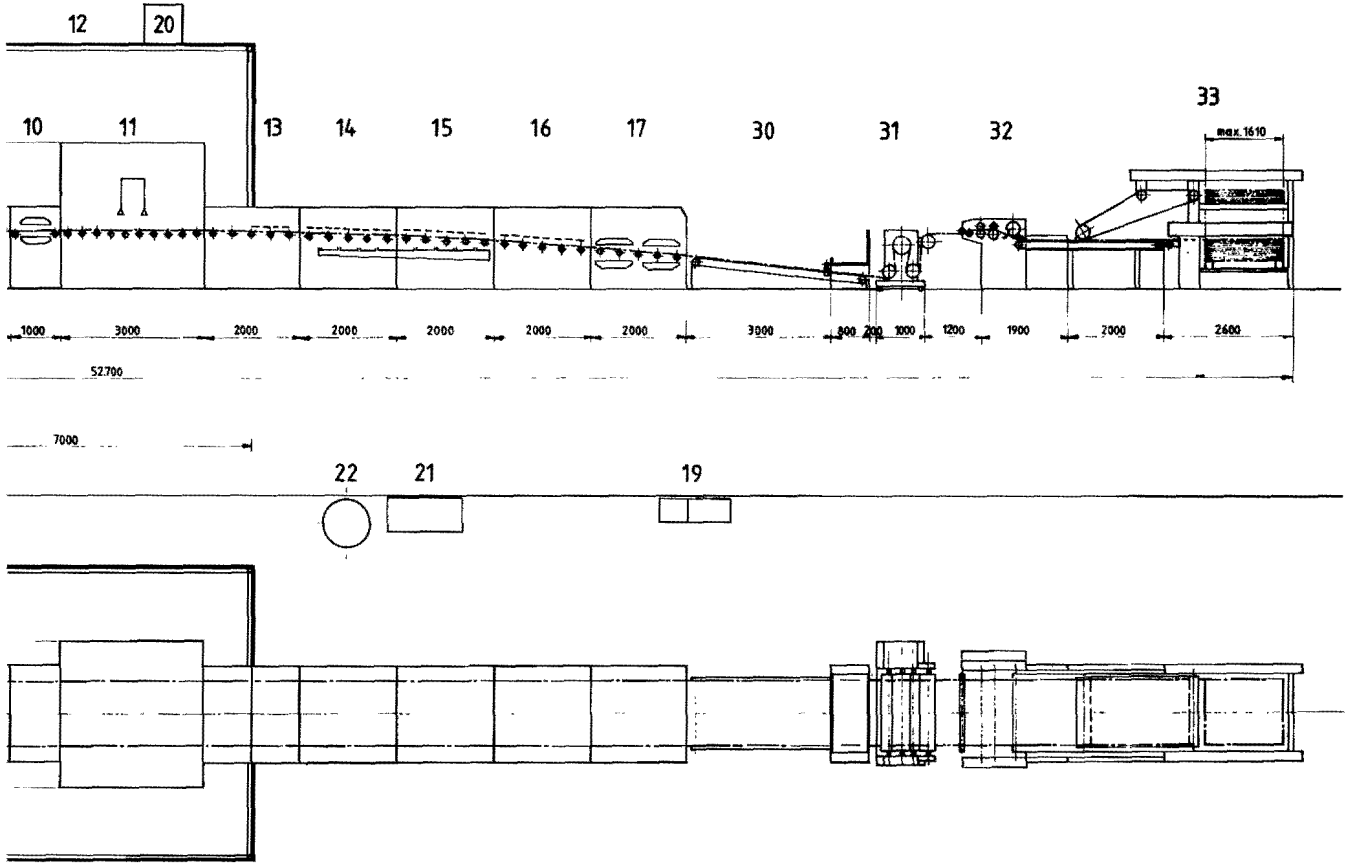
PLANT LAYOUT

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