

Paper: An Engineered Stochastic Structure

Edited by M. Deng, Ph. D. and C. T. J. Dodson, Ph. D.

0101r238

TAPPI PRESS

Paper: an Engineered Stochastic Structure

Edited by M. Deng, Ph. D. and C. T. J. Dodson, Ph. D.

1994. 284 pp., 6" x 9" soft cover

Item Number: 0101R238

ISBN: 0898522838

Table of Contents

Preface	4 Fibre Suspensions
1 Phenomenology and Structure of Paper	4.1 Introduction
1.1 Introduction	4.2 Taylor Turbulence Lengths
1.2 Fibres	4.3 Statistical Packing of Space
1.3 Fibre Suspensions	4.4 Flocculation and Turbulence Models
1.4 Forming Paper	4.5 Stratified Structures
1.5 Paper Structure	4.6 Flocculation
1.6 Porous Properties	4.7 Simulation of Suspensions
1.7 Mechanical Properties	4.8 Neural Networks Methods
1.8 Optical Properties	5 Paper Structure
2 Statistical Background Material	5.1 Introduction
2.1 Introduction	5.2 Random Paper
2.2 Introduction to Statistical Parameters	5.3 Layered Structure
2.3 Common Probability Distributions	5.4 Porous Structure
2.4 Bernoulli and Binomial Distributions	5.5 Fibre Orientation
2.5 Poisson Distribution	5.6 Variance of Local Grammage
2.6 Compound Poisson Distributions	5.7 Flocculated Paper
2.7 Uniform Distribution	5.8 Fibre Spacing and Flocculation
2.8 Negative Exponential Distribution	5.9 Gaps in Flocculated Networks
2.9 Gamma Distribution	Deformation
2.10 Normal Distribution	6.3 Strain-Grammage Regression
2.11 Lognormal Distribution	6.4 Estimating Errors
2.12 Chi-Square Distribution	6.5 Estimating Networks Modulus
3.9 Approximate Random Variance Functions	6.6 Random Elastic Network
3.10 Random Star Patterns	6.7 Regression Predictions
3.11 Three-Dimensional Networks	6.8 Random Model Modulus Prediction
	6.9 Segment Strain Distribution
	7 Fracture of Paper

- 7.1 Introduction
- 7.2 First Impressions
- 7.3 Audio Stochastics
- 7.4 in-Plane Tear
- 7.5 Page's Equation
- 7.6 Micromechanics
- A Statistical Geometric Data
- A.1 Variance in Random Fibre Networks
 - A.1.1 Formation Spreadsheet
 - A.1.2 Interpreting Formation Data
- A.2 Numerical Data for Random Networks
- B List of Principal Symbols
- C Sample Mathematical Code for Selected Functions
- Bibliography

Subject Index

abrasion
absorption
additivity
alignment
along fibres
analogue signal
anemometry
anisotropic roll distributions
anisotropy
antiprojection
aperiodic crystals
aperture size
approximate random
variances
approximation to binomial
beer
Bernouilli distribution
Bessel function
between zone variance
bi-directional drainage
biaxial
binomial distribution
birch
blades
board
bond failures
bonded lengths
bonding disruption
bonding strength
bound water
cellulose-water
cellulose
Central Limit Theorem
charge analysis
chemical fixer
chemistry
chi-square distribution
clicking sounds
cloud chamber
clump models
clumping
clumps
clustering
clusters

coarseness
compression behaviour
compression gradient
compression
condenser paper
contact time
contagious process
continuous random variable
contrast
control loops
control
converting
cooperative smoothing
corona plasma
correlate
correlation
coupling
covariance between layers
coverage
crack tip
crack
creep rate
critical concentration
critical headbox fibre
concentration
crossing fibres
crossings
crowding number
crystalline cellulose
crystallites
curling
dandy mark
debris
decouple
defect tolerance
defects
deformation wave
deformation
degree of bonding
degrees of freedom
delaminated
density gradient
density of contacts
density of crossings
density
depolarization

derivative
discrete random variable
dissociate
distribution of voids
dominant floc size
dot matrix
drainage forces
drying restraints
drying shrinkage
drying
dynamic variables
eddy current transducer
edge tearing strength
effect of fibre width
effective pore radius
elastic constants
elastic material
elastic modulus
electrochemistry
electrography
elongation to break
equivalent pore
errors in strain prediction
evenness
evolution
expansion
expectation
exponential autocovariance
exponential function
extended objects
extreme value distribution
extreme value limit
extreme value statistics
fabric mark
fabric shake
fabric side orientation
fabric side
fabrics
failure mechanism
failure of inter-fibre bonds
fair dice
felted
fibre axis angles
fibre bonding
fibre collapse point
fibre contacts

fibre suspensions
fibre swelling
fibre-clustering
fibres
fibrillar interlocking
fibrillation
fibrils
fibrous length density
fillers
final sheet variability
fine-scale formation detector
fine-scale turbulence inducer
fines
finite aperture
finite inspection zones
finite zones
Finite-element methods
fir
flax
flexibility
flexible
flexing
floc area
floc breakage
floc perimeter
flocculated
flocculation and gaps
flocculation models
flocculation number
flocculation
flocs
flow regime
fluid dynamics
fluid flow
fluid uptake by paper
foam
forecasts
formation indices
formation number
formation spectrum
formation
formers
forming fabric mark
forming fabrics
forming process
forming table

forming
freeness
furnish
gamma distribution
gap formers
gaps and flocculation
gaps
Gaussian distribution
Gaussian
geometrical interpretation
geometrical variables
geometro-hydrodynamic
glass fibres
glassine
global regression equation
gloss
gradient
graininess
grammage
handsheets
hard spheres
hardwood
headbox
high shear
holes
holographic interferometry
holography for strain
human brain
human observers
hybrid blade former
hybrid roll former
hydrogen bonds
hydrogen peroxide
hydrogen-bonded continuum
hydrophylic
hydroxyl groups
hygroexpansivity
hyperbolic geometry
image analysis
imaging
immobilisation
impact model
impermeable
in-plane tear
inadequacy of second-order
inspection zone size

intense wet pressing
inter-crossing segments
inter-fibre bonding
interaction
intercrossing distances
interface
interpreting between zone
variance
interstitial water
interwoven
intra-zonal covariance
isointensity contours
j-integral
joint regression
Kortschot's experiment
kraft
laboratory sheets
laminar flow
laser Doppler anemometry
laser
latex
layered structure
layered
learning algorithm
length density
length to radius ratio
length
light scattering
light transmission
linear transformation
LISA
load-elongation
loadings
local areal density
local density
local drying strains
local fibre orientation
local gradients
local grammage
local optical density
local strain
local thickness variation
log-linear regression
mean gap length
mean grammage
mean pore area

mean pore diameter
mean pore radius
mean pore sizes
mean
mechanical behaviour
mechanical properties
mechanosorptive effect
micro-radiography
microfibrillar structure
microformation
micromechanics
micropores
model random network
mode
modulus prediction
modulus
moisture content
moisture effects
molecular model
molecular orientation
moment generating function
moment of distribution
monofibre layers
moving webs
multi-colour printing
multilayer
multiplanar model
multivariable models
negative exponential
distribution
negative exponential
network modulus
network strength
network
neural network simulators
neural network
newsprint
non-linearity
non-random
normal distribution
normal
nuclear magnetic resonance
number of crossings
optical properties
opaque
orientation anisotropy

orientation distribution
orientation
oxidative degradation
ozone
packing of space
packing problems
packing
pad compressibility
pad evolution
Page equation
pairs of points
paper forming
paper structure
paperboard
papermaker
Parallam
particle size distribution
penetration
perimeters of polygons
permeability
permeable
physical chemistry
physical models
pine
pipe flow
planar anisotropy
planar random lines
plastic deformation energy
plastic deformation zone
plastic elongation
plug flow
polygonal voids
poor spectra
point autocorrelation
function
points
Poisson distribution
Poisson ratio for paper
Poisson
Polarized light
polarized
polyacrylamides
polygon areas
predictor
preferential fibre migration
preferential orientation

preferentially migrate
preserving linear
combinations
pressure distributions
principal direction
print density
print quality
print-through
probability density function
probability function
probability
profilometry
pulp qualities
quadrilaterals
radiography
random deposition
random elastic model
random fibres
random fields
random lines
random network
random pairs of points
random paper
random polygons
random rectangles
random sheet
random spheres
random star patterns
random stars
random triangles
random variable
random
RBA
reciprocal local grammage
recycled fibres
redispersion
reference structure
refiners
refining
reflectance anisotropy
reflectance
reflection detector
roughness
rule of thumb
rupture
saddle shape

sampling zone size
scale
scan lines
scanning device
scanning electron microscopy
scanning
scattering
screening
sedimentation concentration
segment strain distribution
sensors
shape of the function
sharpness
shear load
shear modulus
shear strength
sheet structure
shives
shrinkage pattern
shrinkage profile
shrinkage
simulations
size press
size
skew distribution
Skydome
slice
small strain
small-scale variations
smoothing factor
smoothing
soap
softwood
sonic velocity
specific resistance
specific surface area
specific methods
spectrum
spinning wheel
springwood
spruce
square zones
stiffness
stochastic continuum
stochastic geometry
stochastic processes

stochastic
strain increases thickness
strain prediction
strain-mass covariance
strain-reflectance effect
straining thermal-energy
stratified networks
strengthening
stripes
stroboscope
strong bag paper
strong flocs
structural inhomogeneity
sulphite pulp
superclumping
surface crushing
surface deformation
surface regions
surface tension
surface topography
swelling
symmetric distribution
table activity
Taylor lengths
Taylor turbulence lengths
tear tests
tensile fracture
tensile strain
tensile strength
textural
texture maps
thermal effects
thermal energy
thermal softening
thermodynamics of strain
thermographic imaging
thermorheological
thickening
thickness
three dimensions
three-dimensional structure
threshold concentration
turbulent viscosity
turbulent-like mixing
turbulent
two-stage process

ultrasonic
uncalendered
under-crossings
uniaxial tension
uniaxial
uniform distribution
uniform structures
variance of gap length
variance of gaps
variance of local strain
variances of areal density
variance
velocity field
velocity of sound
video imaging
viscoelastic
viscometers
viscous drag
visual perception
visual ranking
void
volumetric density
vortices
water jet slitting
water retention value
water-water
wavelength power spectrum
weaker regions
Weibull distribution
well-bonded paper
wet pressing
wet straining
wet strength
wetting time
whiteness
width
x-radiography
x-ray diffraction