Figure 31 -
Facteur service

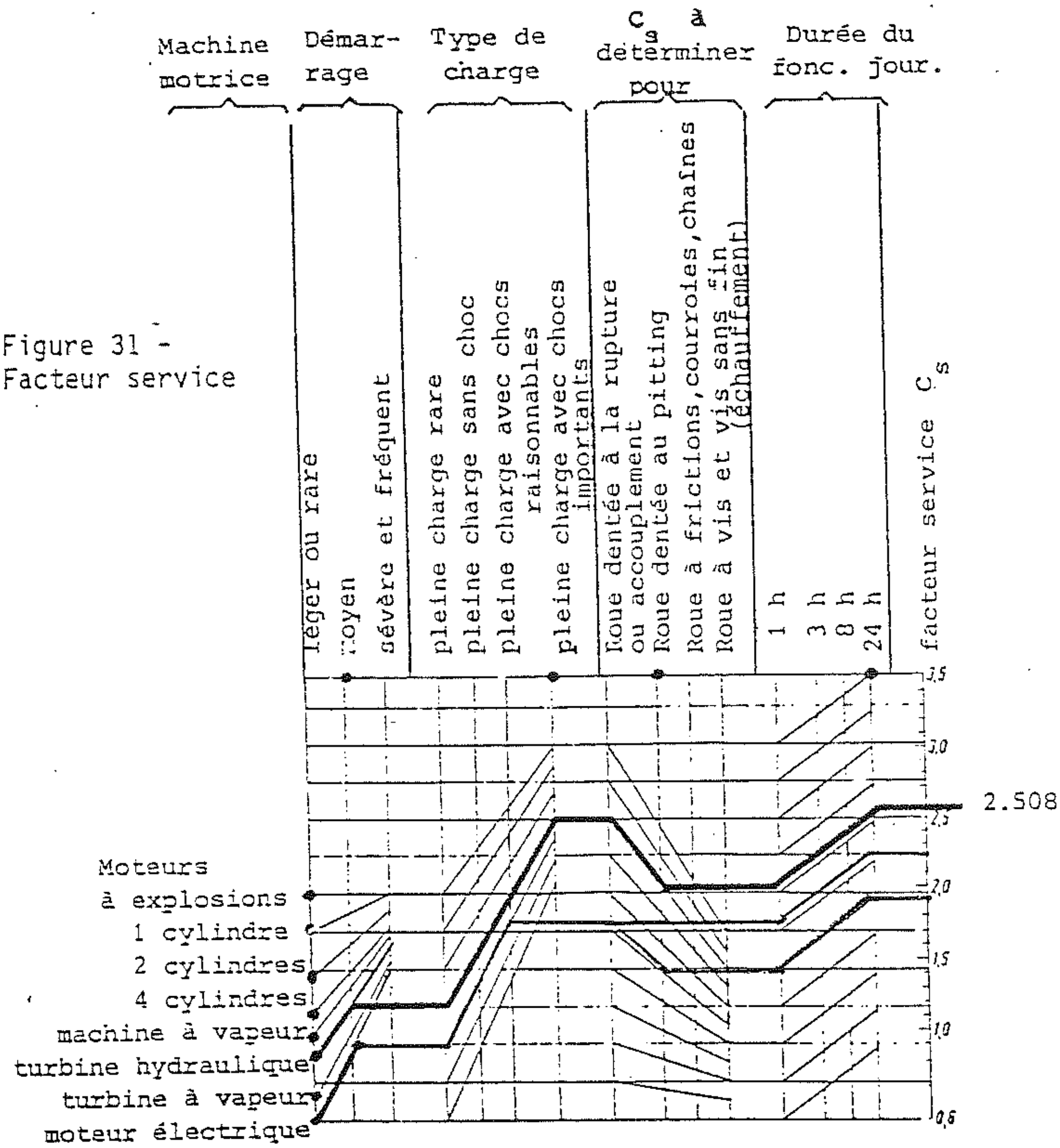
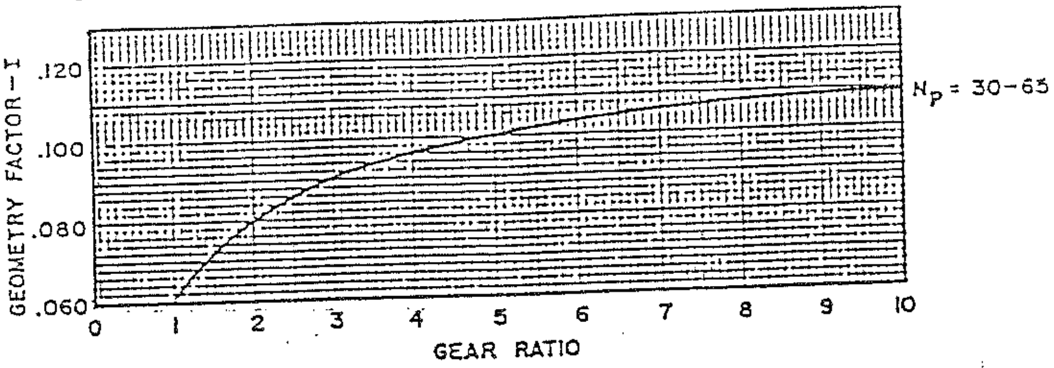
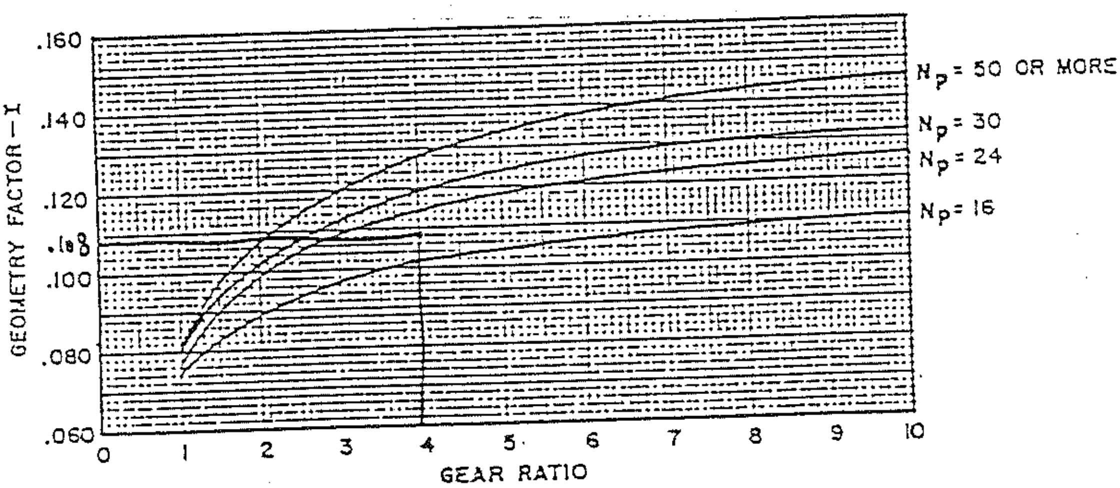


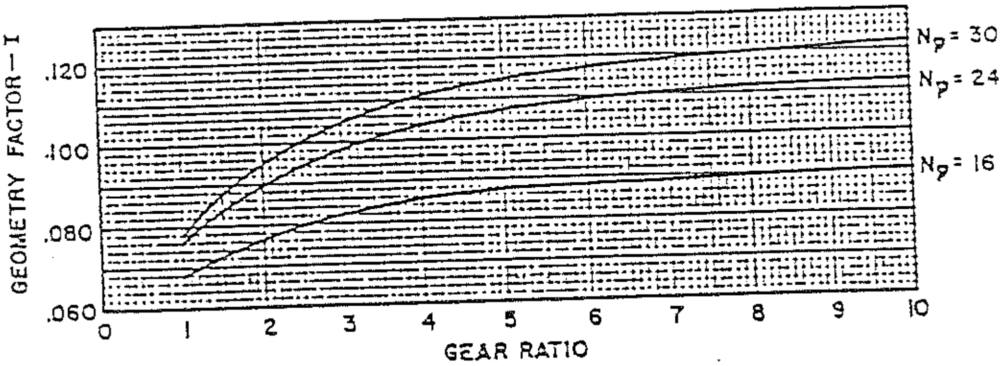
Figure 31 - Facteur service



(A) 14½ Degree Pressure Angle Full Depth Teeth —
(Standard Addendum = $1/P_d$)



(B) 20 Degree Pressure Angle Full Depth Teeth —
(Standard Addendum = $1/P_d$)



(C) 20 Degree Pressure Angle Stub Teeth—
(Standard Addendum = $0.8/P_d$)

NOTE: All curves are for the lowest point of single tooth contact on the pinion.

Fig. A2 External Spur Pinion Geometry Factor, I
(for Standard Center Distances)

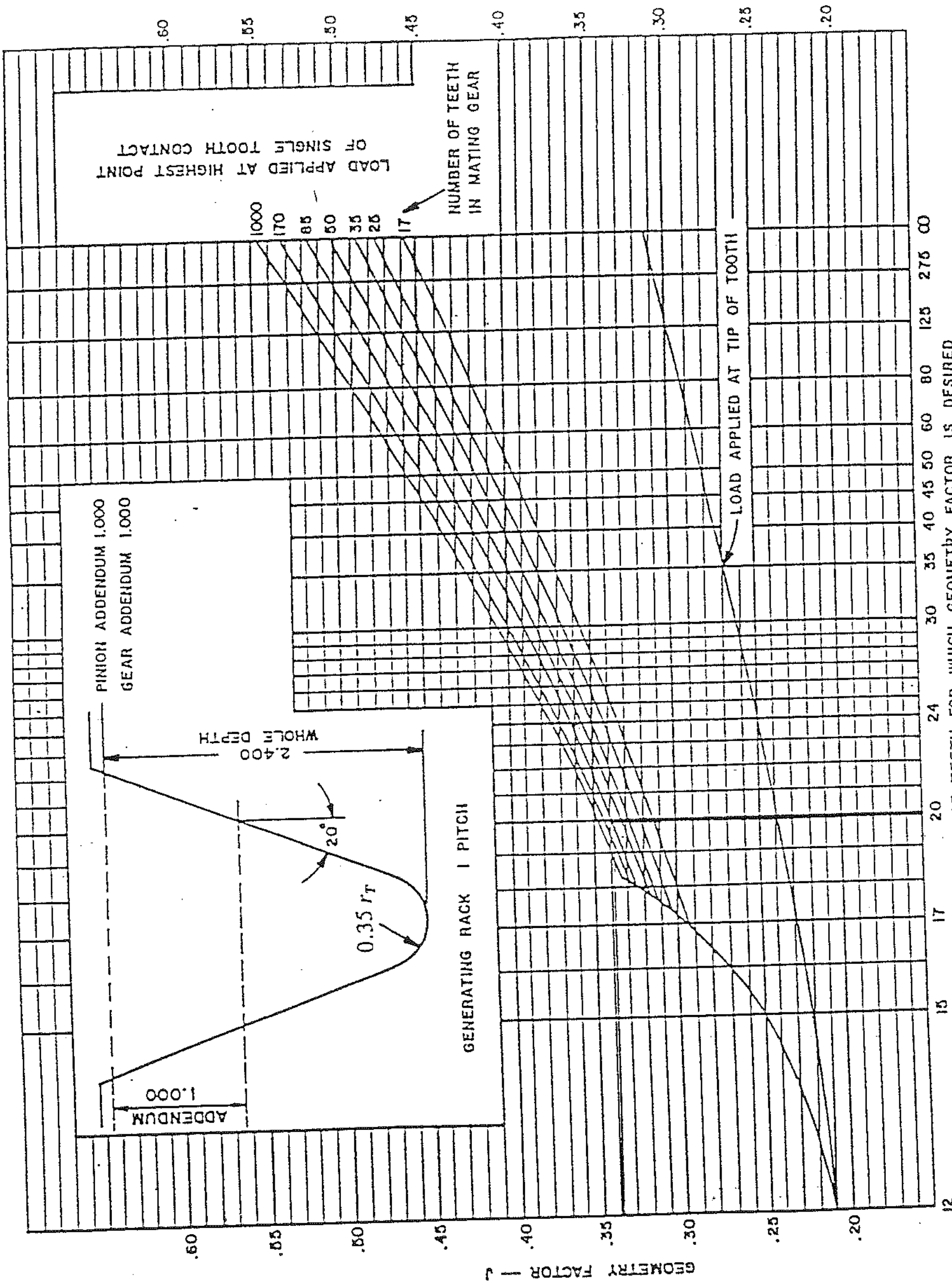


Fig. B1 Geometry Factor, *J*, 20 Degree Spur
(Standard Addendum)

Table 5
Allowable Contact Stress Number, s_{ac}

Material	AGMA Class	Commercial Designation	Heat Treatment	Minimum Hardness at Surface	s_{ac}, lb/in²	(MPa)
Steel	A-1 thru A-5	—	Through Hardened and Tempered (Fig. 14)	180 BHN & less	85-95 000	(590- 660)
				240 BHN	105-115 000	(720- 790)
				300 BHN	120-135 000	(830- 930)
				360 BHN	145-160 000	(1 000-1 100)
				400 BHN	155-170 000	(1 100-1 200)
			Flame* or Induction Hardened*	50 HRC	170-190 000	(1 200-1 300)
				54 HRC	175-195 000	(1 200-1 300)
			Carburized* & Case Hardened*	55 HRC	180-200 000	(1 250-1 400)
				60 HRC	200-225 000	(1 400-1 550)
		AISI 4140	Nitrided*	48 HRC	155-180 000	(1 100-1 250)
		AISI 4340	Nitrided*	46 HRC	150-175 000	(1 050-1 200)
		Nitralloy 135M	Nitrided*	60 HRC	170-195 000	(1 170-1 350)
		2½% Chrome	Nitrided*	54 HRC	155-172 000	(1 100-1 200)
		2½% Chrome	Nitrided*	60 HRC	192-216 000	(1 300-1 500)
Cast Iron	20		As Cast	—	50- 60 000	(340-410)
	30		As Cast	175 BHN	65- 75 000	(450-520)
	40		As Cast	200 BHN	75- 85 000	(520-590)
Nodular (Ductile) Iron	A-7-a	60-14-18	Annealed	140 BHN	90-100% of s_{ac} value of steel with same hardness	
	A-7-c	80-55-06	Quenched & Tempered	180 BHN		
	A-7-d	100-70-03	" "	230 BHN		
	A-7-e	120-90-02	" "	270 BHN		
Malleable Iron (Pearlitic)	A-8-c	45007	—	165 BHN	72 000	(500)
	A-8-e	50005	—	180 BHN	78 000	(540)
	A-8-f	53007	—	195 BHN	83 000	(570)
	A-8-i	80002	—	240 BHN	94 000	(650)
Bronze	Bronze 2	AGMA 2C	Sand Cast	Tensile Strength Minimum 40 000 lb/in² (275 MPa)	30 000	(205)
	Al/Br 3	ASTM B-148-52 Alloy 9C	Heat Treated	Tensile Strength Minimum 90 000 lb/in² (620 MPa)	65 000	(450)

*The range of allowable stress numbers indicated, may be used with the case depths prescribed in paragraph 14.2

Table 6
Allowable Bending Stress Number, s_{at}

Material	AGMA Class	Commercial Designation	Heat Treatment	Minimum Hardness Surface	Core	s_{at}, lb/in²	(MPa)
Steel	A-1 thru A-5	—	Through Hardened and Tempered (Fig. 15)	180 BHN	—	25-33 000	(170-230)
				240 BHN	—	31-41 000	(210-280)
				300 BHN	—	36-47 000	(250-320)
				360 BHN	—	40-52 000	(280-360)
				400 BHN	—	42-56 000	(290-390)
			Flame or Induction Hardened* With Type A Pattern (Fig. 16)	50-54 HRC	—	45-55 000	(310-380)
			Flame or Induction Hardened With Type B Pattern (Fig. 16)		—	22 000	(150)
			Carburized* & Case Hardened*	55 HRC	—	55-65 000	(380-450)
				60 HRC	—	55-70 000	(380-480)
		AISI 4140	Nitrided*†	48 HRC	300 BHN	34-45 000	(230-310)
		AISI 4340	Nitrided*†	46 HRC	300 BHN	36-47 000	(250-325)
		Nitralloy 135M	Nitrided*†	60 HRC	300 BHN	38-48 000	(260-330)
		2½% Chrome	Nitrided*†	54-60 HRC	350 BHN	55-65 000	(380-450)
Cast Iron	20		As Cast	—	—	5 000	(35)
	30		As Cast	175 BHN	—	8 500	(69)
	40		As Cast	200 BHN	—	13 000	(90)
Nodular (Ductile) Iron	A-7-a	60-40-18	Annealed	140 BHN	—	90-100% of s_{at} for steel of same hardness	
	A-7-c	80-55-06	Quenched & Tempered	180 BHN	—		
	A-7-d	100-70-03	" "	230 BHN	—		
	A-7-e	120-90-02	" "	270 BHN	—		
Malleable Iron (Pearlitic)	A-8-c	45007	—	165 BHN	—	10 000	(70)
	A-8-e	50005	—	180 BHN	—	13 000	(90)
	A-8-f	53007	—	195 BHN	—	16 000	(110)
	A-8-i	80002	—	240 BHN	—	21 000	(145)
Bronze	Bronze 2	AGMA 2C	Sand Cast	Tensile Strength Minimum 40 000 lb/in² (275 MPa)		5 700	(40)
	Al/Br 3	ASTM B-148-52 Alloy 9C	Heat Treated	Tensile Strength Minimum 90 000 lb/in² (620 MPa)		23 600	(160)

*The range of allowable stress numbers indicated, may be used with the case depths prescribed in paragraph 14.2

† The overload capacity of nitrided gears is low, since the shape of the effective S-N curve is flat. The sensitivity to sho before proceeding with the design.

AGMA - 218.01

1 Puissance transmise à la pression superficielle (pitting)

$$P_{ac} = \frac{n_p \cdot F}{1{,}91\ 10^7} \; \frac{I \cdot C_v}{C_{SF}} \left[\frac{d\ S_{ac}}{C_p} \right]^2$$

2. Puissance transmise à la flexion (rupture)

$$P_{at} = \frac{n_p\ F}{1{,}91\ 10^7} \; \frac{J \cdot K_v}{K_{SF}} \cdot d \cdot S_{at} \cdot m$$

Symboles : S_{ac}, S_{at} : contraintes admissibles (MPa) Tables 5, 6.

P_{ac}, P_{at} (en KW) puissance transmissible limite.

n_p : vitesse de rot. du pignon (t/min)

F : largeur de la roue (élément le + étroit) (mm)

I, J : facteurs géométriques Fig A2, B1.

$d = \frac{2a}{i \pm 1}$ (mm) a : entraxe
i : rapp. de réd. (>1)
+ : engr. ext. — : engr. int.

$m = \frac{m_n}{\cos \beta_0}$ module apparent (mm) pour denture hélicoïdale

C_{SF}, K_{SF} : facteurs de service (Richter - Ohlendorf)

$C_v, K_v = \left[\frac{A}{A + \sqrt{200\, V_t}} \right]^B$; $B = \frac{(12 - Q_v)^{0,667}}{4}$; $A = 50 + 56(1 - B)$

facteurs dynamiques

$V_{t\,max} = \left[A + (Q_v - 3) \right]^2 / 200$

avec Q_v : qualité de la denture ($6 \leq Q_v \leq 11$)

$C_p = \left[\pi \left(\frac{1 - \mu_p^2}{E_p} + \frac{1 - \mu_R^2}{E_r} \right) \right]^{-1/2}$: coeff. élastique.