

LAMPIRAN 1

Hasil perhitungan nilai ketebalan *Hot Dip Galvanizing* baja jenis P.22 dan S.22

a. Baja Jenis P.22

Temperatur Proses Pelapisan <i>Hot Dip Galvanizing</i>	Ketebalan Lapisan Zn (μm)	Ketebalan Lapisan Zn Rata-Rata (μm)
HDG 445°C	87,6	(88,36 \pm 1,493)
	88,6	
	88,9	
HDG 450°C	107	(105,66 \pm 2,11)
	104	
	106	
HDG 455°C	119	(119 \pm 1,00)
	120	
	118	

$$T = 445^\circ\text{C}$$

$$\bar{t} = \frac{\sum t}{n} = \frac{265,1}{3} = 88,36 \mu\text{m}$$

$$\Delta t = \sqrt{\frac{\sum t^2 - n(\bar{t})^2}{n-1}}$$

$$= \sqrt{\frac{23426,93 - 3.(88,36)^2}{2}}$$

$$= 1,493 \mu\text{m}$$

$$(t \pm \Delta t) = (88,36 \pm 1,493) \mu\text{m}$$

$$T = 450^\circ\text{C}$$

$$\bar{t} = \frac{\sum t}{n} = \frac{317}{3} = 105,66 \mu\text{m}$$

$$\Delta t = \sqrt{\frac{\sum t^2 - n(\bar{t})^2}{n-1}}$$

$$= \sqrt{\frac{33501 - 3.(105,66)^2}{2}}$$

$$= 2,11 \mu\text{m}$$

$$(t \pm \Delta t) = (105,66 \pm 2,11) \mu\text{m}$$

$$T = 455^\circ\text{C}$$

$$\bar{t} = \frac{\sum t}{n} = \frac{357}{3} = 119 \mu\text{m}$$

$$\Delta t = \sqrt{\frac{\sum t^2 - n(\bar{t})^2}{n-1}}$$

$$= \sqrt{\frac{42485 - 3.(119)^2}{2}}$$

$$= 1,00 \mu\text{m}$$

$$(t \pm \Delta t) = (119 \pm 1,00) \mu\text{m}$$

b. Baja Jenis S.22

Temperatur Proses Pelapisan Hot Dip Galvanizing	Ketebalan Lapisan Zn (μm)	Ketebal Lapisan Zn Rata-Rata (μm)
HDG 445°C	62,7	(62,70 \pm 0,20)
	62,9	
	62,5	
HDG 450°C	76,3	(77,16 \pm 1,455)
	77,7	
	77,5	
HDG 455°C	95,1	(94,90 \pm 0,20)
	94,9	
	94,7	

$$T = 445^\circ\text{C}$$

$$\bar{t} = \frac{\sum t}{n} = \frac{188,1}{3} = 62,7 \mu\text{m}$$

$$\Delta t = \sqrt{\frac{\sum t^2 - n(\bar{t})^2}{n-1}}$$

$$= \sqrt{\frac{11793,95 - 3.(62,7)^2}{2}}$$

$$= 0,2 \mu\text{m}$$

$$(t \pm \Delta t) = (62,7 \pm 0,2) \mu\text{m}$$

$$T = 450^\circ\text{C}$$

$$\bar{t} = \frac{\sum t}{n} = \frac{231,5}{3} = 77,16 \mu\text{m}$$

$$\Delta t = \sqrt{\frac{\sum t^2 - n(\bar{t})^2}{n-1}}$$

$$= \sqrt{\frac{17865,23 - 3.(77,16)^2}{2}}$$

$$= 1,455 \mu\text{m}$$

$$(t \pm \Delta t) = (77,16 \pm 1,455) \mu\text{m}$$

$$T = 455^\circ\text{C}$$

$$\bar{t} = \frac{\sum t}{n} = \frac{284,7}{3} = 94,9 \mu\text{m}$$

$$\Delta t = \sqrt{\frac{\sum t^2 - n(\bar{t})^2}{n-1}}$$

$$= \sqrt{\frac{27018,11 - 3.(94,9)^2}{2}}$$

$$= 0,2 \mu\text{m}$$

$$(t \pm \Delta t) = (94,9 \pm 0,2) \mu\text{m}$$

LAMPIRAN 2

Hasil perhitungan nilai kekerasan *Hot Dip Galvanizing* baja jenis P.22 dan S .22

a. Baja Jenis P.22

Perlakuan <i>Hot Dip Galvanizing</i>	Kekerasan (VHN)	Kekerasan rata-rata (VHN)
HDG 445°C	550	(550,33 ± 2,415)
	550	
	551	
HDG 450°C	525	(524,66 ± 3,290)
	524	
	525	
HDG 455°C	516	(515,33 ± 2,342)
	515	
	415	

T = 445°C

$$\overline{VHN} = \frac{\sum VHN}{n} = \frac{1651}{3} = 550,33$$

$$\Delta VHN = \sqrt{\frac{\sum VHN^2 - n(\overline{VHN})^2}{n-1}}$$

$$= \sqrt{\frac{908601 - 3.(550,33)^2}{2}}$$

$$= 2,415$$

$$(VHN \pm \Delta VHN) = (550,33 \pm 2,415)$$

T = 450°C

$$\overline{VHN} = \frac{\sum VHN}{n} = \frac{1574}{3} = 524,66$$

$$\Delta VHN = \sqrt{\frac{\sum VHN^2 - n(\overline{VHN})^2}{n-1}}$$

$$= \sqrt{\frac{825826 - 3.(524,66)^2}{2}}$$

$$= 3,290$$

$$(VHN \pm \Delta VHN) = (524,66 \pm 3,290)$$

T = 455°C

$$\overline{VHN} = \frac{\sum VHN}{n} = \frac{1546}{3} = 515,33$$

$$\Delta VHN = \sqrt{\frac{\sum VHN^2 - n(\overline{VHN})^2}{n-1}}$$

$$= \sqrt{\frac{796706 - 3.(515,33)^2}{2}}$$

$$= 2,342$$

$$(VHN \pm \Delta VHN) = (515,33 \pm 2,342)$$

b. Baja Jenis S.22

Perlakuan <i>Hot Dip Galvanizing</i>	Kekerasan (VHN)	Kekerasan rata-rata (VHN)
HDG 445°C	532	(531,66 ± 3,311)
	532	
	531	
HDG 450°C	530	(530 ± 1,00)
	531	
	529	
HDG 455°C	527	(526 ± 1,00)
	526	
	525	

$$T = 445^{\circ}\text{C}$$

$$\overline{VHN} = \frac{\sum VHN}{n} = \frac{1595}{3} = 531,66$$

$$\begin{aligned} \Delta VHN &= \sqrt{\frac{\sum VHN^2 - n(\overline{VHN})^2}{n-1}} \\ &= \sqrt{\frac{908601 - 3.(531,66)^2}{2}} \\ &= 3,311 \end{aligned}$$

$$(VHN \pm \Delta VHN) = (531,66 \pm 3,311)$$

$$T = 450^{\circ}\text{C}$$

$$\overline{VHN} = \frac{\sum VHN}{n} = \frac{1590}{3} = 530$$

$$\begin{aligned} \Delta VHN &= \sqrt{\frac{\sum VHN^2 - n(\overline{VHN})^2}{n-1}} \\ &= \sqrt{\frac{825826 - 3.(530)^2}{2}} \\ &= 1,00 \end{aligned}$$

$$(VHN \pm \Delta VHN) = (530 \pm 1,00)$$

$$T = 455^{\circ}\text{C}$$

$$\overline{VHN} = \frac{\sum VHN}{n} = \frac{1578}{3} = 526$$

$$\begin{aligned} \Delta VHN &= \sqrt{\frac{\sum VHN^2 - n(\overline{VHN})^2}{n-1}} \\ &= \sqrt{\frac{796706 - 3.(526)^2}{2}} \\ &= 1,00 \end{aligned}$$

$$(VHN \pm \Delta VHN) = (526 \pm 1,00)$$

LAMPIRAN 3

Hasil perhitungan nilai laju korosi *Hot Dip Galvanizing* baja jenis P.22 dan S.22

a. Baja Jenis P.22

Perlakuan <i>Hot Dip Galvanizing</i>	W1 (mg)	ρ (gr/cm ³)	A (inchi ²)	Waktu (Jam)	Laju Korosi (mpy)
Tanpa Perlakuan	1318,1	5,897	1,735	36	1,910981617
445°C	112,9	7,258	2,23	36	0,103469147
450°C	9,7	7,282	1,659	36	0,011910045
455°C	8,3	7,224	1,705	36	0,009995735

$$\begin{aligned}
 \triangleright W_i &= m_1 - m_2 \\
 &= 11,6502 - 10,3321 \\
 &= 1,3181 \text{ gr} \\
 &= 1318,1 \text{ mg}
 \end{aligned}$$

$$\begin{aligned}
 \Delta W_1 &= \left| \frac{\partial W}{\partial m_1} \right| \Delta m_1 + \left| \frac{\partial W}{\partial m_2} \right| \Delta m_2 \\
 &= |-m_2| \Delta m_1 + |m_1| \Delta m_2 \\
 &= |-10,3321| 0,00005 + |11,6502| 0,00005 \\
 &= 0,001099115 \text{ gr} \\
 &= 1,099 \text{ mg}
 \end{aligned}$$

$$W_i \pm \Delta W_i = (1318,1 \pm 1,099) \text{ mg}$$

$$\begin{aligned}
 A &= 2\pi r^2 + 2\pi r t \\
 &= 2.3,14.0,433^2 + 2.3,14.0,433.0,205 \\
 &= 1,520 \text{ inchi}^2
 \end{aligned}$$

$$\begin{aligned}
 \Delta A &= \left| \frac{\partial A}{\partial r} \right| \Delta r + \left| \frac{\partial A}{\partial t} \right| \Delta t \\
 &= |4\pi r + 2\pi r| \Delta r + |2\pi r| \Delta t \\
 &= |8,15772| 0,005 + |2,719| 0,005
 \end{aligned}$$

$$= 0,054 \text{inchi}^2$$

$$A \pm \Delta A = (1,520 \pm 0,054) \text{inchi}^2$$

$$v = \pi r^2 t$$

$$= 3,14 \cdot 11^2 \cdot 5,2$$

$$= 1975,688 \text{mm}^3$$

$$= 1,975688 \text{cm}^3$$

$$\Delta v = \left| \frac{\partial A}{\partial r} \right| \Delta r + \left| \frac{\partial A}{\partial t} \right| \Delta t$$

$$= |2\pi r t| \Delta r + |2\pi r^2| \Delta t$$

$$= |359,216| 0,005 + |759,88| 0,005$$

$$= 5,59548 \text{mm}^3$$

$$= 0,00559548 \text{cm}^3$$

$$v \pm \Delta v = (1,976 \pm 0,00559) \text{cm}^3$$

$$\rho = \frac{m_1}{v}$$

$$= \frac{11,6502}{1,975688}$$

$$= 5,897 \text{ gr/cm}^3$$

$$\Delta \rho = \left| \frac{\partial \rho}{\partial m_1} \right| \Delta m_1 + \left| \frac{\partial \rho}{\partial v} \right| \Delta v$$

$$= \left| \frac{1}{v} \right| \Delta m_1 + \left| -\frac{m_1}{v^2} \right| \Delta v$$

$$= \left| \frac{1}{1,975688} \right| 0,00005 + \left| -\frac{11,6502}{1,975688^2} \right| 0,00559548$$

$$= 0,017 \text{ gr/cm}^3$$

$$\rho \pm \Delta \rho = (5,897 \pm 0,017) \text{ gr/cm}^3$$

$$\begin{aligned}
 V_k &= \frac{534WI}{\rho AT} \\
 &= \frac{534.1318,1}{5,897.1,735.36} \\
 &= 1,910981617MPY
 \end{aligned}$$

$$\begin{aligned}
 \Delta V_k &= \left| \frac{\partial MPY}{\partial WI} \right| \Delta M + \left| \frac{\partial MPY}{\partial A} \right| \Delta A + \left| \frac{\partial MPY}{\partial \rho} \right| \Delta \rho \\
 &= \left| \frac{534}{A.t.\rho} \right| \Delta M + \left| -\frac{534.WI}{A^2.t.\rho} \right| \Delta A + \left| -\frac{534.WI}{A.t.\rho^2} \right| \Delta \rho \\
 &= \left| \frac{534}{1,735.36.5,897} \right| 0,00005 + \left| -\frac{534.1381,1}{1,735.36.5,897^2} \right| 0,054 + \\
 &\quad \left| -\frac{534.1,3181}{1,735.36.5,897^2} \right| 0,017 \\
 &= 0,02414449MPY \\
 V_k \pm \Delta V_k &= (1,911 \pm 0,0241)MPY
 \end{aligned}$$

b. Baja Jenis S.22

Perlakuan <i>Hot Dip Galvanizing</i>	W1 (mg)	ρ (gr/cm ³)	A (inchi ²)	Waktu (Jam)	Laju Korosi (mpy)
Tanpa Perlakuan	1517,5	7,112	1,723	36	2,039313485
445°C	187,5	7,534	1,661	36	0,22225154
450°C	12,7	7,393	1,258	36	0,020254926
455°C	14,2	7,383	1,701	36	0,016773081

$$\triangleright W_i = m_1 - m_2$$

$$= 13,7812 - 12,2637$$

$$= 1,5175 \text{ gr}$$

$$= 1517,5 \text{ mg}$$

$$\Delta W_1 = \left| \frac{\partial W}{\partial m_1} \right| \Delta m_1 + \left| \frac{\partial W}{\partial m_2} \right| \Delta m_2$$

$$= |-m_2| \Delta m_1 + |m_1| \Delta m_2$$

$$= |-12,2637| 0,00005 + |13,7812| 0,00005$$

$$= 0,001302245 \text{ gr}$$

$$= 1,302245 \text{ mg}$$

$$W_i \pm \Delta W_i = (1517,5 \pm 1,302245) \text{ mg}$$

$$A = 2\pi r^2 + 2\pi r t$$

$$= 2.3,14.0,433^2 + 2.3,14.0,433.0,201$$

$$= 1,723 \text{ inchi}^2$$

$$\Delta A = \left| \frac{\partial A}{\partial r} \right| \Delta r + \left| \frac{\partial A}{\partial t} \right| \Delta t$$

$$= |4\pi r + 2\pi r| \Delta r + |2\pi r| \Delta t$$

$$= |8,159| 0,005 + |2,719| 0,005$$

$$= 0,054 \text{ inchi}^2$$

$$A \pm \Delta A = (1,723 \pm 0,054) \text{inchi}^2$$

$$v = \pi r^2 t$$

$$= 3,14.11^2.5,1$$

$$= 1937,649 \text{mm}^3$$

$$= 1,937694 \text{cm}^3$$

$$\Delta v = \left| \frac{\partial A}{\partial r} \right| \Delta r + \left| \frac{\partial A}{\partial t} \right| \Delta t$$

$$= |2\pi r t| \Delta r + |2\pi r^2| \Delta t$$

$$= |352,308|0,005 + |759,88|0,005$$

$$= 5,56094 \text{mm}^3$$

$$= 0,00556094 \text{cm}^3$$

$$v \pm \Delta v = (1,938 \pm 0,00556) \text{cm}^3$$

$$\rho = \frac{m_1}{v}$$

$$= \frac{13,7812}{1,937694}$$

$$= 7,112$$

$$\Delta \rho = \left| \frac{\partial \rho}{\partial m_1} \right| \Delta m_1 + \left| \frac{\partial \rho}{\partial v} \right| \Delta v$$

$$= \left| \frac{1}{v} \right| \Delta m_1 + \left| -\frac{m_1}{v^2} \right| \Delta v$$

$$= \left| \frac{1}{1,937694} \right| 0,00005 + \left| -\frac{13,7812}{1,937694^2} \right| 0,00556$$

$$= 0,005634802 \text{gr/cm}^3$$

$$\rho \pm \Delta \rho = (7,112 \pm 0,00563) \text{gr/cm}^3$$

$$\begin{aligned}
 V_k &= \frac{534WI}{\rho AT} \\
 &= \frac{534.1517,5}{7,112.1,552.36} \\
 &= 2,039313485MPY \\
 \Delta V_k &= \left| \frac{\partial MPY}{\partial WI} \right| \Delta M + \left| \frac{\partial MPY}{\partial A} \right| \Delta A + \left| \frac{\partial MPY}{\partial \rho} \right| \Delta \rho \\
 &= \left| \frac{534}{A.t.\rho} \right| \Delta M + \left| -\frac{534.WI}{A^2.t.\rho} \right| \Delta A + \left| -\frac{534.WI}{A.t.\rho^2} \right| \Delta \rho \\
 &= \left| \frac{534}{1,552.36.7,112} \right| 0,00005 + \left| -\frac{534.1517,5}{1,552^2.36.7,112} \right| 0,054 + \\
 &\quad \left| -\frac{534.1517,5}{1,552.36.7,112^2} \right| 0,00563 \\
 &= 0,0726MPY \\
 V_k \pm \Delta V_k &= (2,0393 \pm 0,0729)MPY
 \end{aligned}$$