Tank Factors

Key	
TF	Tank Factor
V	Volume
P	Pressure

- Cubic Footage Per 100psi in a set of doubles/sidemount
- Used to convert between volume and pressure in Imperial
- Unnecessary in Metric

Rated Volume / Rated Pressure X 100 X 2 = Tank Factor

Rated Volume/Rated Pressure — Gives us the number of cubic feet per single psi
X100 — Because our gauges don't read single psi, they read in 100s
X2 — Because we have two tanks in our unified gas supply

(RV/RP) x 100 X 2 = TF

Common Tank Factors	
AL80	5
LP85/HP100	6
LP95/HP120	7
LP104/HP130	8

EXAMPLE: Aluminium 80s

77.5cf / 3000psi = .025cf per single psi
.025 X 100 = 2.5cf per 100psi in a single tank
2.5 X 2 = 5cf per 100psi in doubles

77.5/3000 X 100 X 2 = 5
(RV/RP) X 100 X 2 = TF

Applying Tank Factors

V =	P/100 X TF
P =	V/TF X 100

- Converting Pressure to Volume
- Converting Volume to Pressure
- 100 is used as a conversion figure (for hundreds of psi)
- "Divide the other then multiply"

Volume from Pressure

V = P/100 X TF

EXAMPLE: We have used 700psi in a set of double 80s; how much volume is this?

700psi / 100 = 7
7 X 5 (TF) = 35cf

700/100 X 5 = V = 35

Pressure from Volume

P = V/TF X 100

EXAMPLE: To gas match we need to determine the pressure of 40cf in a set of AL80s

40cf / 5 (TF) = 8
8 X 100 = 800psi

40/5 X 100 = P = 800

Breathing Intervals

Depth in ATA	
33' / 10M	2
66' / 20M	3
99' / 30M	4

- 5 minute blocks of gas consumption
- Practical way of gas planning / estimating usage
- Measured in PSI/BAR
- Dependant on
  - Personal SAC rate
  - Tanks being used
- SAC rate should be known (can default to .75cf/m - 20L/m)
- Can be written down or memorised and applied to any dive (using applicable tanks)

EXAMPLE: Diver with a SAC rate of .5cf/m uses double AL80s. What are their Intervals?

1: Calculate RMV adjusted for depth
Multiply SAC by depth in ATA

Depth (In ATA)	RMV
1 (Surface)	.5cf/m (SAC)
2	1
3	1.5
4	2

2: Convert cf/m to psi/min using tank factor
P = V/TF X 100
P = 1 (cf/m at 2ATA) / 5 (TF) = .2
2 X 100 = 20psi/min
Complete the rest of the table

Depth (In ATA)	RMV	PSI/min
1 (Surface)	.5cf/m (SAC)	10
2	1	20
3	1.5	30
4	2	40

3: Multiply PSI/min by 5
20psi is a useless measurement and no one checks pressure every minute

Depth (In ATA)	RMV	PSI/min	PSI/5 minutes
1 (Surface)	.5cf/m (SAC)	10	50
2	1	20	100
3	1.5	30	150
4	2	40	200

4: Eliminate extraneous information from table
Ignore surface row and middle columns
Change "Depth" header to local units
Change "PSI/5 minutes" header to "Interval"

Depth	Interval
33	100
66	150
99	200

5: Write this down in wetnotes

6: Remember this is personal and for specific tank size

Applying Intervals

- Estimate gas usage for a given dive
- Multiply depth-dependent 5 minute blocks to determine how much is needed or estimate how much has been used
- Pressure gauges are not ultra-accurate, reasonable rounding is expected

EXAMPLE A: Diver with the above intervals has been in 60 foot passage for 25 minutes. How much gas has been consumed?

25 minutes / 5 minute intervals = 5 intervals
150 X 5 = 750

25 minutes is 5 intervals
150 is the interval for 66' (the closest to our target depth)
Diver has likely consumed around 700psi since they're a little shallower

EXAMPLE B: Same diver plans to spend 40 minutes at 40 feet. How much gas will be consumed?

40 minutes / 5 minute intervals = 8 intervals
100 X 8 = 800

40 minutes is 8 intervals
100psi is the interval for 33'
Diver can expect to need a bit more than 800psi. Call it ~900psi.

Swim Speed / Distance

Sort of obvious
Multiply time by feet/minute

- 20fpm is barely moving
- 30fpm is pretty slow
- **40fpm is pretty average**
- 50fpm is pretty fast
- 60fpm is a likely-unsustainable sprint

EXAMPLE: Team has been swimming for 40 minutes at 30fpm. How far into the cave are they?

40 X 30 = 1200 feet

Recalculation of Thirds

Key	
SP	Starting Pressure
UP	Usable Pressure
TP	Turn Pressure
MG	Minimum Gas

- Allows for further exploration
- Retains donateable gas in case of OOG emergency
- Requires extreme situational awareness!

Planning

1: Team agrees enough gas exists to recalculate
2: Note exact location of cave and time required to exit
3: Multiply intervals to determine personal gas required
4: Double that figure to determine Minimum Gas required to exit in an OOG emergency
5: Subtract that as a Reserve Gas from current Starting Pressure
6: Calculate Usable Pressure (thirds) from the remainder
7: Each team member communicates their UP. Lowest UP is UP for the entire team.
8: Subtract new UP from current SP to determine new TP

EXAMPLE: During the return swim your team wants to explore a jump 15 minutes from the exit. You have 1600psi remaining in your backgas.

15 minutes swim would require 3 intervals. Let's say you have intervals of 100psi. So 300psi are required for your exit. But we need to plan for two.

MG = 300 X 2
MG = 600psi

Current SP is 1600
Reserving MG of 600psi we can figure our Provisional Starting Pressure
1600 - 600 = 1000

We can calculate our new UP from this Provisional Pressure
900/3 = 300
UP = 300psi

At this point the team will communicate each member's UP
Whomever has the lowest UP sets the UP for the entire team
In this case it's our diver with 300psi

So we subtract our UP from our SP to determine our new TP

1600 - 300 = 1300psi

TP = 1300psi

"<u>Half Plus" Stage Usage</u>

- Sets aside a reserve in backgas from used stage volume
- Retains donateable gas in case of
  : Failed stage bottle on pick-up
  : Gas sharing exit
  : Both of the above
- Significantly safer than thirds applied across the board

Key	
SP	Starting Pressure
UP	Usable Pressure
TP	Turn Pressure
DP	Drop Pressure

<u>Planning</u>

1: Half stage bottle Starting Pressure
2: Add 200psi or 20 bar for Drop Pressure
3: Calculate volume of stage bottle Usable Pressure using Tank Factor
4: Calculate the corresponding pressure in backgas
5: Subtract this pressure from Starting Pressure
6: Calculate Usable Pressure (thirds) from the remainder
7: Subtract Usable Pressure from Starting Pressure to determine Turn Pressure on backgas

EXAMPLE: Diver starts a dive with 3000psi in both backgas and a single stage bottle

We start with the stage:

DP = SP/2 + 200
DP = 3000/2 + 200
DP = 1500 + 200
DP = 1700psi

UP = SP - DP
UP = 3000 - 1700
UP = 1300psi

V =	P/100 X TF
P =	V/TF X 100

We must reserve the 1300psi we've used from the stage in backgas

Convert the Usable Pressure to volume:
V = 1300/100 X 2.5 (NOTE: TF is 1/2 because of the singularity of the stage)
V = 13 X 2.5
V = 32.5cf
Rounded up to 33 for good measure

Convert the 33cf back into a pressure in backgas
P = 33/5 X 100
P = 6.6 X 100
P = 660psi
Rounded up to 700 for good measure
700psi is our Reserve Pressure

True Starting Pressure - Reserve Pressure = Provisional Starting Pressure
3000 - 700 = 2300psi

We calculate thirds based on this Provisional Pressure of 2300psi
Drop down to divisible by 3 = 2100
2100/3 = 700
UP = 700
TP = SP - UP
TP = 3000 - 700
TP = 2300

Our resultant gas plan:
DP = 1700 :::: TP = 2300