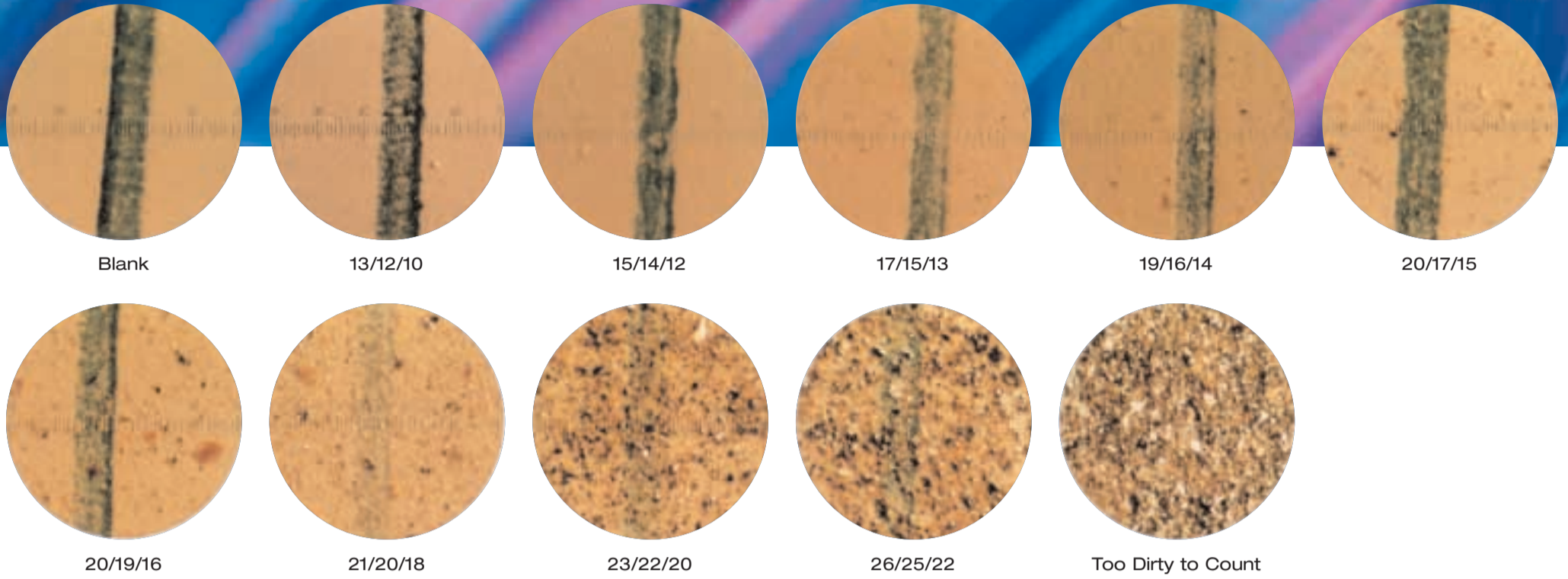


How Clean is Your System Fluid?

Fluid Contamination Levels (ISO 4406:1999)



Recommended Fluid Cleanliness Level Worksheet* (pdf downloadable at www.pall.com/m&e)

1. Operating Pressure & Duty Cycle

Duty	Examples	Operating Pressure, bar (psi)					Actual
		0-70 (0-1000)	>70-170 (>1000- 2500)	>170-275 (>2500-4000)	>275-410 (>4000- 6000)	>410 (>6000)	
Light	Steady duty	1	2	3	4		
Medium	Moderate pressure variations	2	3	4	5	6	
Heavy	Zero to full pressure	3	4	5	6	7	
Severe	Zero to full pressure with high frequency transients	4	5	6	7	8	

2. Component Sensitivity

Sensitivity	Examples	Weighting	Actual
Minimal	Ram pumps	1	
Below Average	Low performance gear pumps, manual valves, poppet valves	2	
Average	Vane pumps, spool valves, high performance gear pumps	3	
Above Average	Piston pumps, proportional valves	4	
High	Servo valves, high pressure proportional valves	6	
Very High	High performance servo valves	8	

3. Equipment Life Expectancy

Life Expectancy (hours)	Weighting	Actual
0 - 1,000	0	
1,000 - 5,000	1	
5,000 - 10,000	2	
10,000 - 20,000	3	
20,000 - 40,000	4	
>40,000	5	

4. Component Replacement Cost

Replacement Cost	Examples	Weighting	Actual
Low	Manifold mounted valves, inexpensive pumps	1	
Average	Line mounted valves and modular valves	2	
High	Cylinders, proportional valves	3	
Very High	Large piston pumps, hydrostatic transmission motors, high performance servo components	4	

5. Equipment Downtime Cost

Downtime Cost	Examples	Weighting	Actual
Low	Equipment not critical to production or operation	1	
Average	Small to medium production plant	2	
High	High volume production plant	4	
Very High	Very expensive downtime cost	6	

6. Safety Liability

Safety Liability	Examples	Weighting	Actual
Low	No liability	1	
Average	Failure may cause hazard	3	
High	Failure may cause injury	6	

7. Cleanliness Requirement Total

Cleanliness Requirement Total Weighting	Total
Sum of "Actual" weighting from sections 1 through 6	

Using the chart at right, determine where the "Cleanliness Requirement Total Weighting" number from section 7 intersects the red line. Follow across to the Left to determine the recommended ISO 4406 Code. Note: On-line monitoring is required below ISO 14/12/09

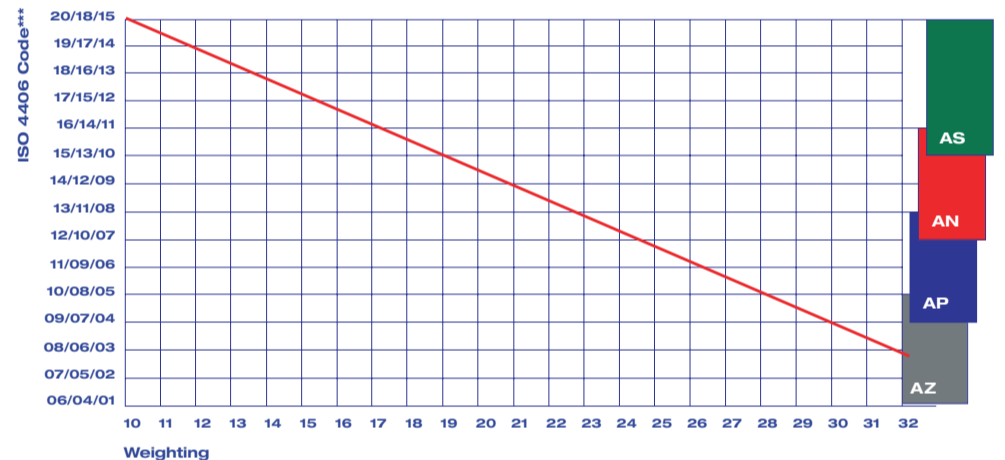
8. Environmental Weighting

Environment	Examples	Weighting		Actual
		Single Filter**	Multiple Filters**	
Good	Clean areas, few ingress points, filtered fluid filling, air breathers	0	-1	
Fair	General machine shops, some control over ingress points	1	0	
Poor	Minimal control over operating environment and ingress points (e.g. on-highway mobile equipment)	3	2	
Hostile	Potentially high ingress (e.g. foundries, concrete mfg., component test rigs, off-highway mobile equip.)	5	4	

9. Required Filtration Level

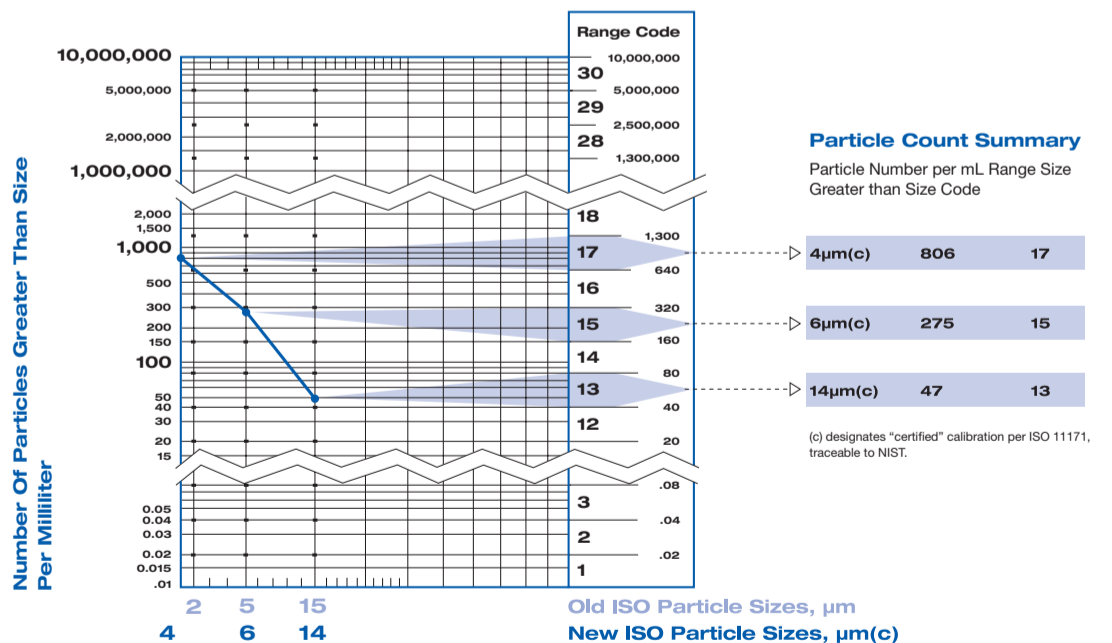
Filtration Requirement Total Weighting	Total
Add Environmental Weighting (section 8) to Cleanliness Requirement Total (section 7)	

Using the chart at right, determine where the "Required Filtration Level" total in section 9 intersects the red line. Follow across to the Right to find the corresponding Recommended Pall filter media grade.



*** Using on-line particle counting

Understanding the ISO Code



The ISO Code references the number of particles greater than 4, 6, and 14 microns(c) in one milliliter of sample fluid. To determine the ISO Cleanliness Code for a fluid, the results of particle counting are plotted on a graph. The corresponding Range Code, shown at the right of the graph, gives the Cleanliness Code Number for each of the three particle sizes.

Each numerical increase in the Range Code represents a doubling of the particulate contamination in the fluid. Therefore, the higher the Range Code, the greater the fluid contamination.



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* Adapted from BFPA/P5 Target Cleanliness Level Selector 1999 Issue 3
** Single filter or multiple filters with the same media grade on the system