Energy Savings

ARMSTRONG

Need to replace or repair your pumps?
Time to tune up for premium efficiency:

•Reduced running costs •Lower maintenance •More comfortable environment

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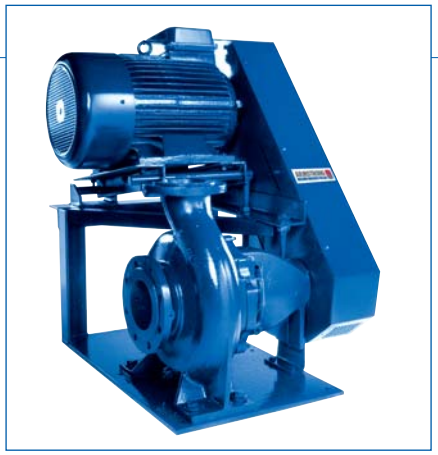
Tune up your pump systems



Doing a building refurbishment and need to comply with Part L2B of the Building Regulations?

Are the circulating or booster pumps on their last legs?

Need to save money running your building services?

Struggling to hold back increasing maintenance charges?

Want to reduce your electricity bills?

Then check your plant rooms and ask yourself these questions:

- ▶Are there Holden and Brooke, Pullen, Armstrong, Crane or Baric Pumps installed?
- ▶Are any pumps belt driven?
- ▶Are they started by Direct on line or Star Delta starters?
- ▶Are the cold water booster sets fitted with horizontal pumps?
- ▶Are the commissioning valves on the main headers part closed?
- ▶Is the heating or chilled water system fitted with three port valves and by-pass circuits?

If the answer to any of these questions is yes, then this guide will help you save money.

Armstrong has decades of experience manufacturing, servicing, refurbishing and replacing pump and booster sets made by these manufacturers. The knowledge is condensed into this guide in an easy to follow format to help plant maintenance and service engineers find the optimal solution.

In this guide, we use a typical example of a belt driven pump with a duty of 20 l/s at 160kPa.
Note how, as the system is tuned up in a stage by stage method, the power absorbed and the running costs drop.

The example in this guide assumes an electricity cost of 10p/kWH and 8000 hours/year running.

Efficient and cost effective

▶ Stage 1.0 Tune - Convert to Close-Coupled with trimmed impeller

▶Opportunity: Belt driven pumps.

▶Challenges: Pump end speed is oversized for the duty (due to the limited number of pump end speeds) with the commissioning set throttled down to compensate.
Power losses from the belt drive.
Pump set is oversized to allow for possible future duty increases.
Maintenance issues with the belt drive.

▶Solution: Convert to the close-coupled relative of the installed pump, using the existing pump casing and pipe work.

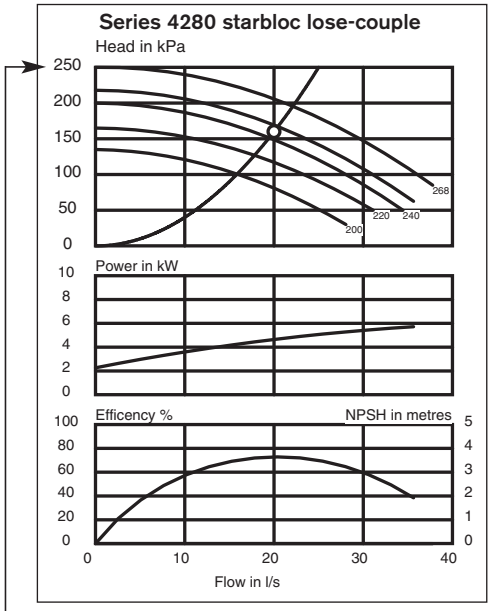
▶Results: Impeller is trimmed to the exact duty requirements, allowing the commissioning set to be opened up, reducing power absorbed and saving money. No belt drive losses, reducing power absorbed and saving money. Motor sized to the actual working duty, not oversized, saving money.
Reduced maintenance requirements, saving money.
Smoother, quieter operation, reducing noise and vibration.

▶Example duty: 80-250 Starflex belt drive pump absorbs 5.77kW at the projection of the duty point to the 1450 rpm curve.
80-250H Starbloc close-coupled pump absorbs 4.69kW with impeller trimmed to the duty. A 17% saving in absorbed power.

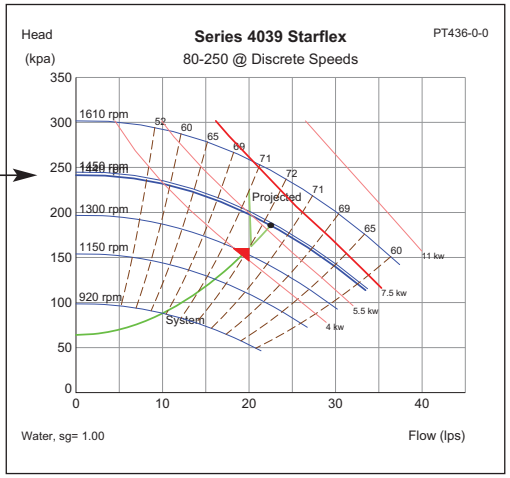
▶Savings: £864 pa.

▶Note: No pipe changes required for installation. The close-coupled pump will be approximately 150mm longer, so the designer must check for the required space behind the pump as installed.

▶Available for: Holden and Brooke Starflex – converts to Starbloc.
Holden and Brooke Starfix - converts to Starline.
Holden and Brooke Starfix Twin – converts with rotating. assembly from Starbloc, re-using the installed body housing.
Pullen C range TB drive – converts to Pullen KC.
Pullen A and B range belt drive – also converts to Pullen KC.
Pullen CP range – converts easily to KCP.
Baric Veepak – post 1996 models convert to Starbloc.
Baric Veeline – VE and VL models accept Linepak rotating assemblies.
Armstrong 4039 and 41BD – converts easily to 4280.



Note that impeller is trimmed to the exact duty, minimizing waste energy"



Note that the Starflex impeller curve at 1450 rpm overshoots the design duty, wasting energy and power

▶ Stage 2.0 Tune - Convert to variable speed, variable volume pumps

▶Opportunity: Constant water volume, fixed speed, belt driven or direct driven pumps on three port control.

▶Challenges: Constant absorbed pump power irrespective of any variation in demand from the heating or cooling system.
Power losses from the drive on belt driven pumps.
Maintenance issues with the pulley/belt drive.
Pump set is oversized at installation to allow for possible future duty increases.

▶Solution: Convert to variable speed, variable volume pumps with two port control. Use IVS Sensorless software on motors up to 55.0kW to remove the need for BMS control.
Convert to the close coupled relative of the installed pump.

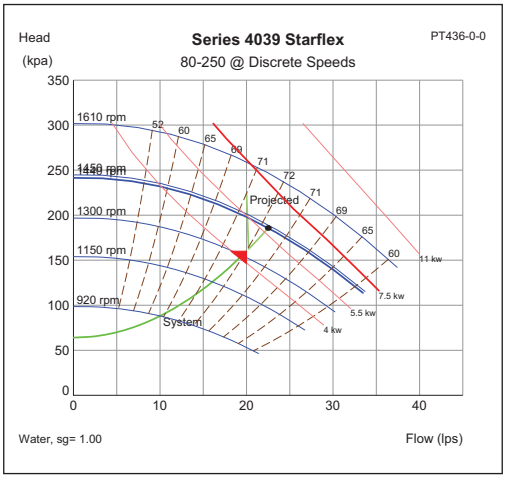
▶Results: Variable speed, reduced power absorbed at part load conditions, saving running costs.
Pump absorbed power varies as the cube of the speed, so a small speed reduction provides significant running cost savings.
Reduced maintenance, saving money.
Impeller trimmed to the exact duty, saving power and money.
Motor sized to the actual duty, reducing the carbon foot print.
Smoother, quieter operation, reducing project risk.

▶Example duty: 80-250 Starflex belt drive pump absorbs 5.77kW at the projection of the duty point to the 1450 rpm curve.
80-250H Starbloc close coupled variable speed IVS Sensorless pump absorbs 4.69kW with impeller trimmed to the duty, at 1450 rpm.
80-250H Starbloc close coupled variable speed IVS Sensorless pump absorbs 1.5kW at 50% design flow, running at 1000 rpm.
A 30% reduction in speed produces a saving of 74% on power consumed, compared with the fixed speed Starflex.

▶Savings: £3,400 pa at continuous 50% load.

▶Note: No pipe changes required for installation. The close-coupled pump will be approximately 150mm longer, so the designer must check for the required space behind the pump as installed.

▶Available for: Holden and Brooke Starflex – converts to IVS Sensorless Starbloc up to 7.5kW.
Holden and Brooke Starflex – converts to IVS Starbloc up to 55.0kW.
Holden and Brooke Starfix - converts to IVS Sensorless Starline.
Holden and Brooke Starfix Twin – converts with rotating assembly from IVS Sensorless Starbloc, re-using the installed body housing.
Holden and Brooke Starbloc – converts to IVS Sensorless Starbloc up to 55.0kW.
Holden and Brooke Starnorm – converts to IVS Sensorless Starnorm up to 55.0kW.
Pullen C range TB drive – converts to Pullen KC IVS Sensorless.
Pullen A and B range belt drive – converts to Pullen KC IVS Sensorless.
Pullen CP - converts easily to Pullen KCP IVS Sensorless.
Pullen KC - IVS Sensorless conversion.
Pullen SKP/SKK - IVS Sensorless conversion (wall mounted drive).
Pullen VM and VPM - IVS Sensorless conversion (wall mounted drive).
Baric Veepak – post 1996 models convert to IVS Sensorless Starbloc up to 55.0kW.
Baric Veeline – VE and VL models accept IVS Sensorless Linepak rotating assemblies.
Armstrong 4039 and 41BD – converts easily to IVS Sensorless 4280 at all kW ratings.
Armstrong 4380 convert to IVS Sensorless up to 55.0kW.
Armstrong 4280 convert to IVS Sensorless up to 55.0kW.
Armstrong 4300 convert to IVS Sensorless up to 55.0kW.
Armstrong 4302 convert to IVS Sensorless up to 55.0kW.
Armstrong 4382 convert to IVS Sensorless up to 55.0kW.
Crane EF and EFT convert with IVS Sensorless rotating assemblies.



▶ Stage 2.1 Tune - Convert to variable speed pumps

▶Opportunity: Constant water volume, fixed speed, belt driven or direct driven pumps on three port control.

▶Challenges: Power wasted through commissioning valves throttled down in the main header.
Power losses from the drive on belt driven pumps.
Maintenance issues with the pulley/belt drive.
Pump set is oversized at installation to allow for possible future duty increases.

▶Solution: Convert to variable speed pumps.
Use motor mount drives up to 55.0kW
Convert to the close coupled relative of the installed pump.
Open up commissioning set.
Reduce motor speed to compensate.

▶Results: Reduced power absorbed.
Pump absorbed power varies as the cube of the speed, so a small reduction offers significant running cost reductions.
No belt drive losses – further reduced power absorbed.
Less maintenance.
Impeller trimmed to exactly to the duty requirement, saving more power.
Motor sized to your actual installed duty.
Smoother, quieter operation.

▶Note: No pipe changes required for installation. The close-coupled pump will be approximately 150mm. longer, so the designer must check for the required space behind the pump as installed.

▶Available for: Holden and Brooke Starflex – converts to IVS Sensorless Starbloc up to 55.0kW.
Holden and Brooke Starfix - converts to IVS Sensorless Starline.
Holden and Brooke Starfix Twin – converts with rotating assembly from
IVS Sensorless Starbloc, re-using the installed body housing.
Holden and Brooke Starbloc – converts to IVS Sensorless Starbloc up to 55.0kW.
Holden and Brooke Starnorm – converts to IVS Sensorless Starnorm up to 55.0kW.
Pullen C range TB drive – converts to Pullen KC - IVS Sensorless conversion.
Pullen A and B range belt drive – also converts to Pullen KC - IVS Sensorless conversion.
Pullen CP range – converts to KCP IVS Sensorless.
Baric Veepak – post 1996 models convert to IVS Sensorless Starbloc up to 55.0kW
Baric Veeline – VE and VL models accept IVS Sensorless Linepak rotating assemblies.
Armstrong 4039 and 41BD – converts to IVS Sensorless 4280.
Armstrong 4380 convert to IVS 4380 up to 55kW.
Armstrong 4280 convert to IVS 4380 up to 55kW.
Armstrong 4300 convert to IVS 4380 up to 55kW.
Armstrong 4302 convert to IVS 4380 up to 55kW.
Armstrong 4382 convert to IVS 4380 up to 55kW.
Crane EF and EFT convert with IVS Sensorless rotating assemblies
Pullen KC - IVS Sensorless conversion.
Pullen SKP/SKK - IVS Sensorless conversion (wall mounted drive).
Pullen VM and VMP - IVS Sensorless conversion
(wall mounted drive).
Holden and Brooke Starline converts to Starline IVS Sensorless.
Holden and Brooke Startwin converts to Startwin IVS Sensorless.

▶ Stage 3.0 Tune

▶Opportunity: All fixed speed Holden and Brooke, Pullen and Baric Pumps – close coupled, long coupled and belt driven.

▶Challenges: Decades-old hydraulic designs are less efficient than those of today, thus wasting power.
Constant absorbed pump power irrespective of heating/cooling demand of the system.
Power losses from the drive on belt drive.
Maintenance issues with the pulley/belt drive.
Pump set is oversized at installation to allow for possible future duty increases.
Pump end speed is fixed too high for the system requirement with commissioning set closed down.

▶Solution: Change out the pump completely and install a new design high efficiency unit. Save further power by fitting Sensorless motors up to 55.0kW
Many IVS Sensorless 4380 and 4392 Pump in Box sizes available ex stock.
Consider pipeline mounted in-line pumps and remove flexible connectors and inertia bases.
Consider Split Coupled 4300 in line pump above 5.5kW motor to reduce whole life costs.

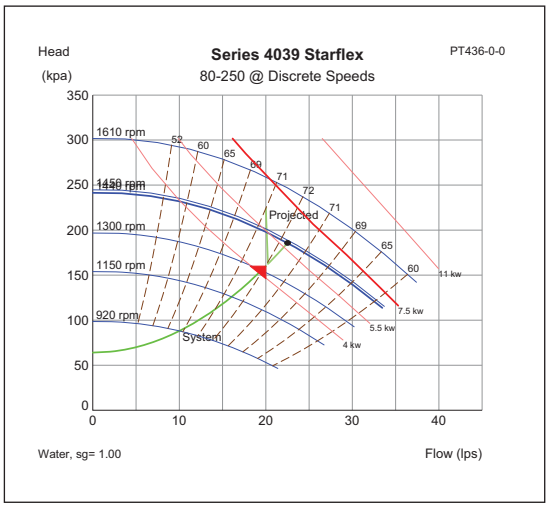
▶Results: No belt drive losses – reduced power absorbed.
Reduced power absorbed through high efficiency hydraulic.
Further reduced power absorbed through variable speed.
Reduced maintenance.
Motor is sized to actual installed duty requirements.
Smoother, quieter operation.
Safer, more reliable pipe work system with flexible connectors removed.
Reduced cost with no flexible connectors, saving capital cost.
Reduced labour cost to change out a mechanical seal on 4300, saving money.

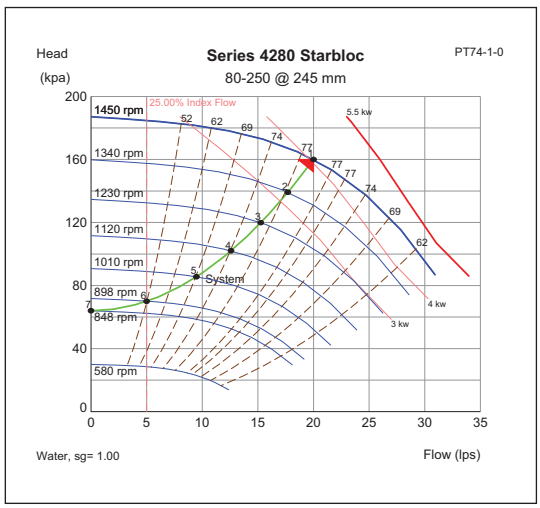
▶Example duty: 80-250 Starflex belt drive pump absorbs 5.77kW at the projection of the duty point to the 1450 rpm curve.
80-250A Armstrong 4280 close coupled variable speed IVS Sensorless pump absorbs 4.17kW with impeller trimmed to the duty, at 1450 rpm.
80-250A Armstrong 4280 close coupled variable speed IVS Sensorless pump absorbs 1.07kW at 50% load, speed 1010 rpm.
A 30% reduction in speed produces a 90% plus reduction in absorbed power compared to the original belt driven Starflex pump.

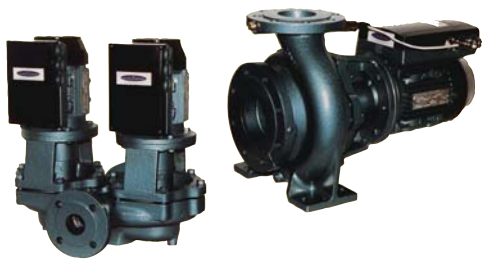
▶Savings: £3,760 pa at continuous 50% load.

▶Note: Stage 3.0 solutions will require changes to the pipe to accomodate the new pump, but provide maximum power savings.
The Payback Calculator on the back cover will help determine years to pay back and total life cycle savings.

▶Available for: All Holden and Brooke, Baric Pumps and Pullen Pumps and pre 1988 Armstrong pumps.







New design high efficiency pump absorbs 28% less power than the Starflex at full load and 90% less power at 50% load

Booster Sets

▶ Stage 1.0 Tune

▶Opportunity: Booster set fitted with single stage pumps.

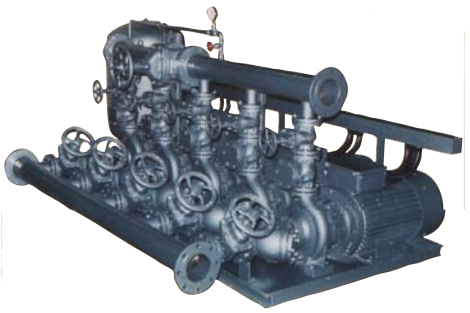
▶Challenges: Low efficiency at all points on the pump curve.
Especially low efficiency during periods of low demand.
Booster set pumps are oversized for system water supply and/or pressure requirements.
High noise levels.
Pressure surges seen at showers.

▶Solution: Convert to a 6800 booster set with several multistage pumps, all on variable speed control.
Remove pressure regulating valve, if fitted, as it will become redundant.

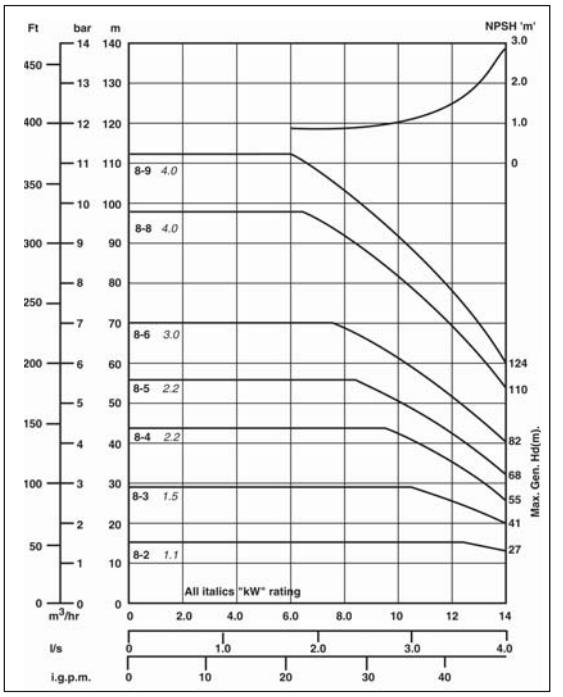
▶Results: Higher efficiency multistage pumps absorb less power than single stage pumps.
This benefit is especially pronounced at low demand flow as each multistage pump is sized for best efficiency at a smaller flow rate than the single stage pump.
Variable speed pump set produces constant pressure, reducing surges at the showers.
Removal of pressure regulating valve removes a power sapping device.
Pressure setting can be easily trimmed down to actual building requirement – saving further power.
Smoother, quieter operation as motors are smaller and pumps are quieter.
6800 set has Soft Fill function allowing gradual restoration of water pressure after a power outage, preventing shock pressures.

▶Available for: Holden and Brooke Starpak booster fitted with Starbloc pumps.
Pullen Hydropak booster fitted with KC, KL or KM pumps.
Baric boosters fitted with LT or MB or ME pumps.
Armstrong boosters fitted with 4280 or 4380 pumps.

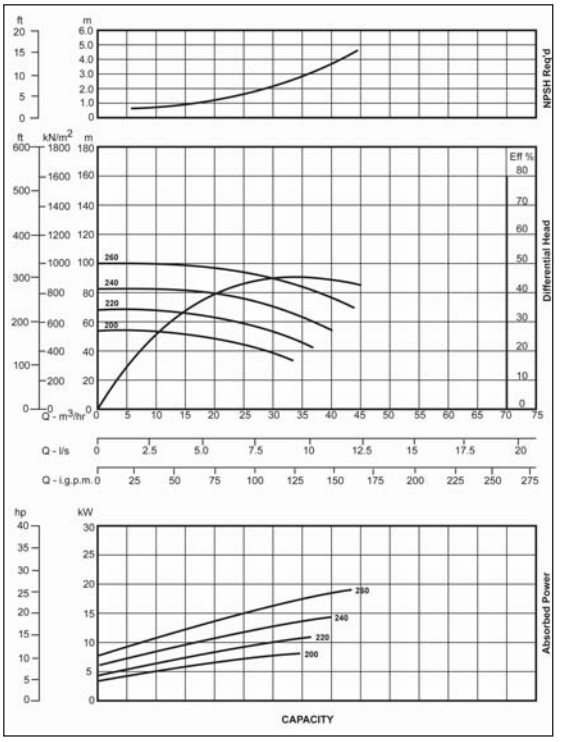
New 6800
IVS booster set



Old Starbloc booster set



SV8 multistage booster pump curve.
Note peak efficiency of over 60% at 3.0l/s water demand – 35 points better than that shown below.



40-250H Starbloc booster pump curve.
Note peak efficiency of 45% at 10.0 l/s water demand and 25% at 3.0l/s water demand.

▶ Payback Calculator

INFORMATION NEEDED

- FLOW (l/s)
- HEAD (kPa)
- EFFICIENCY
- POWER COST (kWh)
- HOURS PER YEAR
- COST OF SENSORLESS

ESTIMATE USING £800/kW AS A GUIDE PRICE

FIXED SPEED PUMP COST

FLOW (l/s) X HEAD (kPa) / (996.6 X EFFICIENCY (0.70))= 1.1 kW

1.2 kW X POWER COST (kWh) (£0.10) = 2.1 COST PER HOUR

2.2 COST PER HOUR X 8000 HOURS PER YEAR = FIXED SPEED OPERATING COST

CALCULATOR USING THE ARMSTRONG SENSORLESS

The typical numbers shown below assume a 50% reduction from maximun load.

FLOW (l/s) X ACTUAL FLOW % OF DESIGN (50%) = NEW FLOW

HEAD (kPa) – SENSOR SETTING (HEAD X 0.40) X ACTUAL FLOW % OF DESIGN X ACTUAL FLOW OF DESIGN (25%) + SENSOR SETTING (HEAD X 0.40) = NEW HEAD

SENSORLESS PUMP COST

NEW FLOW X NEW HEAD X / (996.6 X EFFICIENCY (0.70))= 3.1 kW

3.2 kW X POWER COST (kWh) = 4.1 COST PER HOUR

4.2 COST PER HOUR X HOURS PER YEAR = SENSORLESS OPERATING COST

SENSORLESS RETURN ON INVESTMENT

FIXED SPEED OPERATING COST – SENSORLESS OPERATING COST = 5.1 SAVINGS PER YEAR

COST OF SENSORLESS / 5.2 SAVINGS PER YEAR = YEARS TO PAY BACK

(20* X 5.3 SAVINGS PER YEAR) – COST OF SENSORLESS = TOTAL LIFECYCLE SAVINGS

* AVERAGE LIFESPAN OF SENSORLESS

Our policy is one of continuous improvement and we reserve the right to alter our dimensions and specifications without notice

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