

odborný seminář

Řízené pohony čerpadel

4. prosince 2013

ČVUT FS, Ústav výrobních strojů a zařízení, Horská 3, Praha 2  
v posluchárně A-136 v 1. patře budovy A

JAROŠ ROMAN

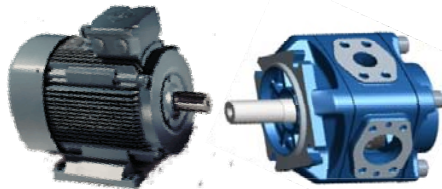
Bosch Rexroth, spol. s r.o., Těžební 2, 627 00 Brno; CZ,  
roman.jaros@boschrexroth.cz

Replacement of a P-Q-system by a SYHDFEn-system of Bosch Rexroth

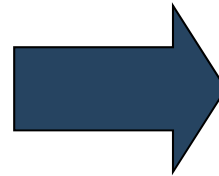
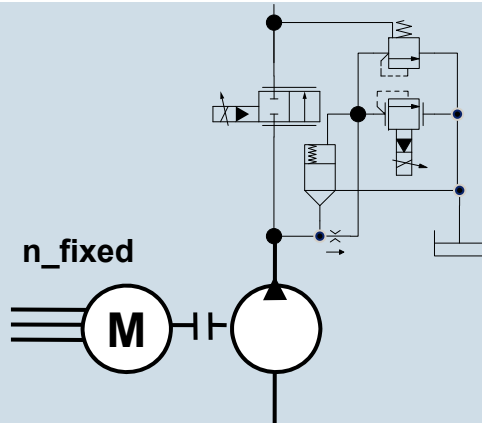
# Energy Saving at Die Cast Machines with Bosch Rexroth

## Replacement of a P-Q-system by a SYHDFEn-system of Bosch Rexroth

### Fixed Pump System



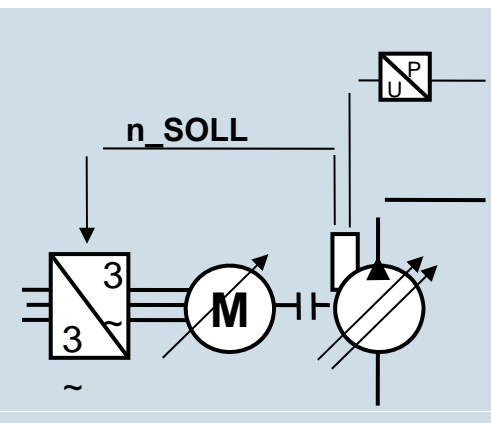
System



### DFEn 5000



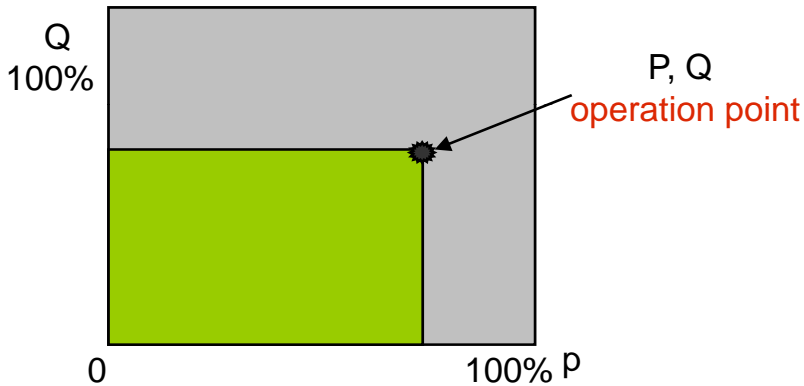
System



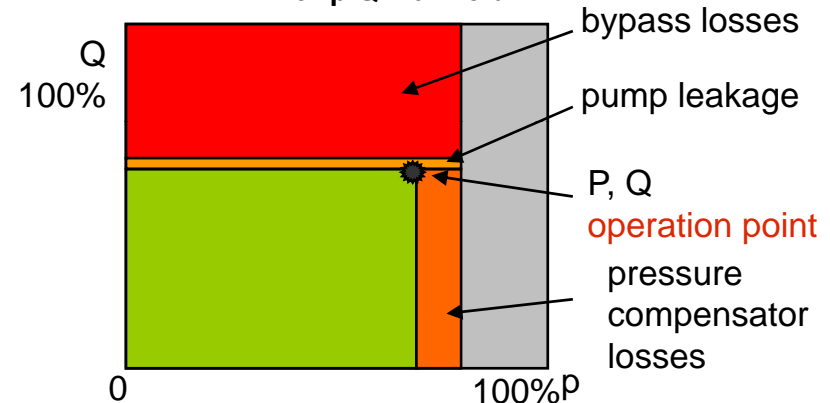
# Energy Saving at Die Cast Machines with Bosch Rexroth

## Hydraulic energy losses at different pump systems

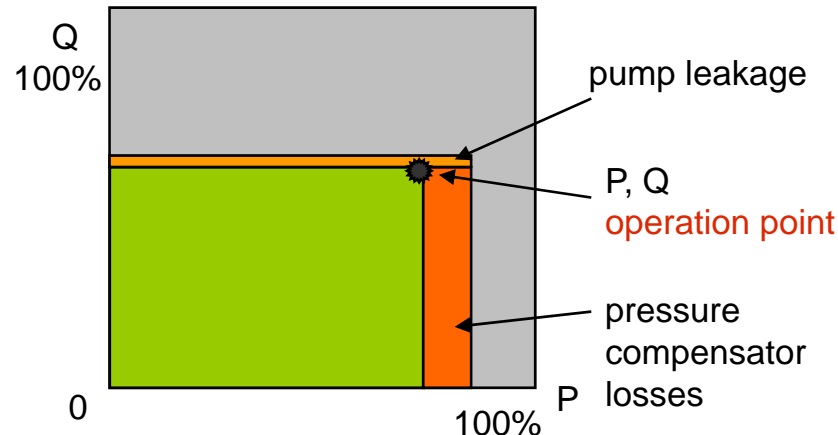
Required power for actuator



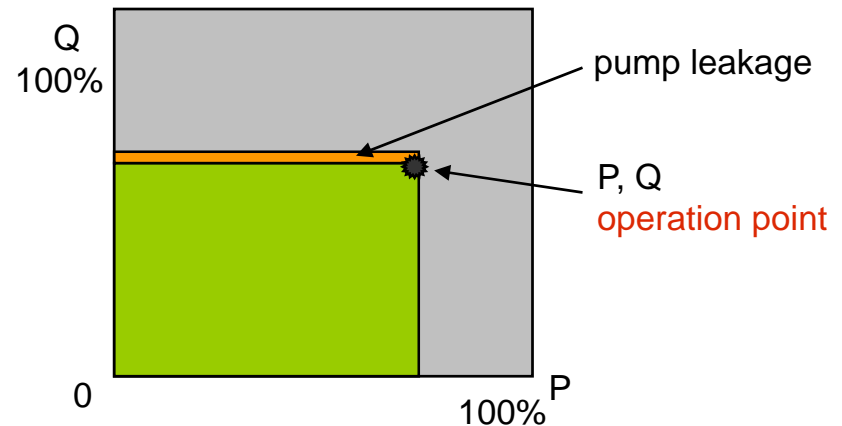
Constant pump with p/Q manifold



Variable pump with load sensing (DFR1)

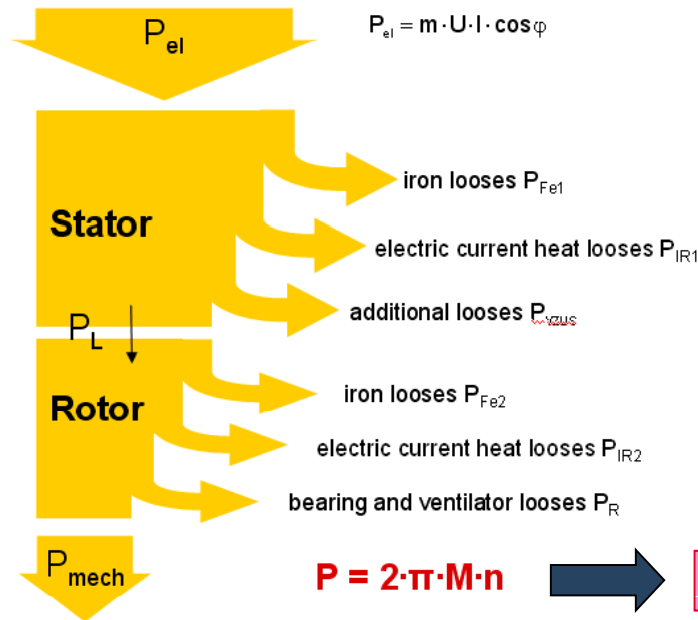
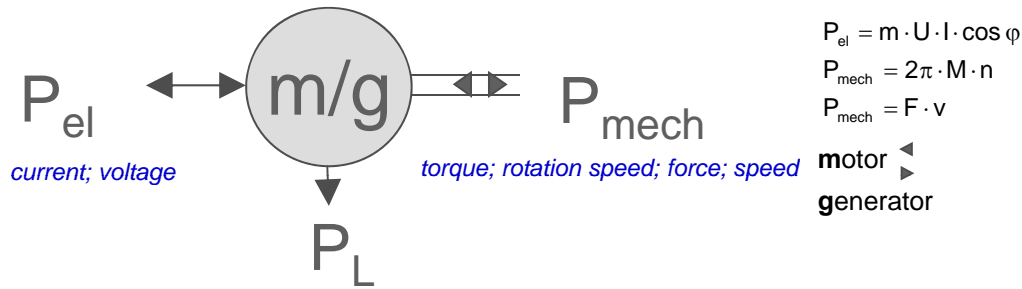


Variable pump with DFEE - control



# Energy Saving at Die Cast Machines with Bosch Rexroth

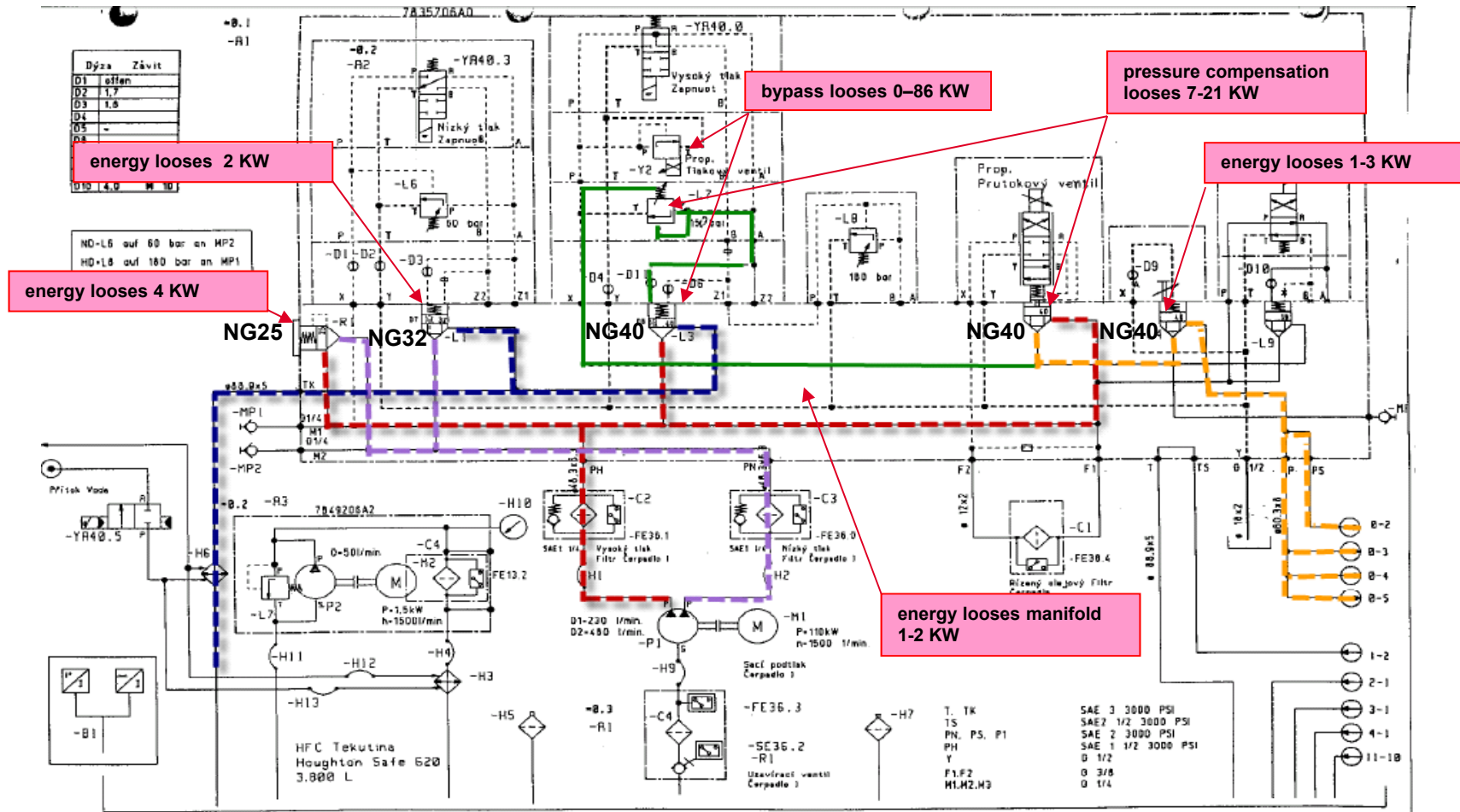
## Electric energy losses of an asynchronous motor



reduction of rotation speed = reduction of P mech.

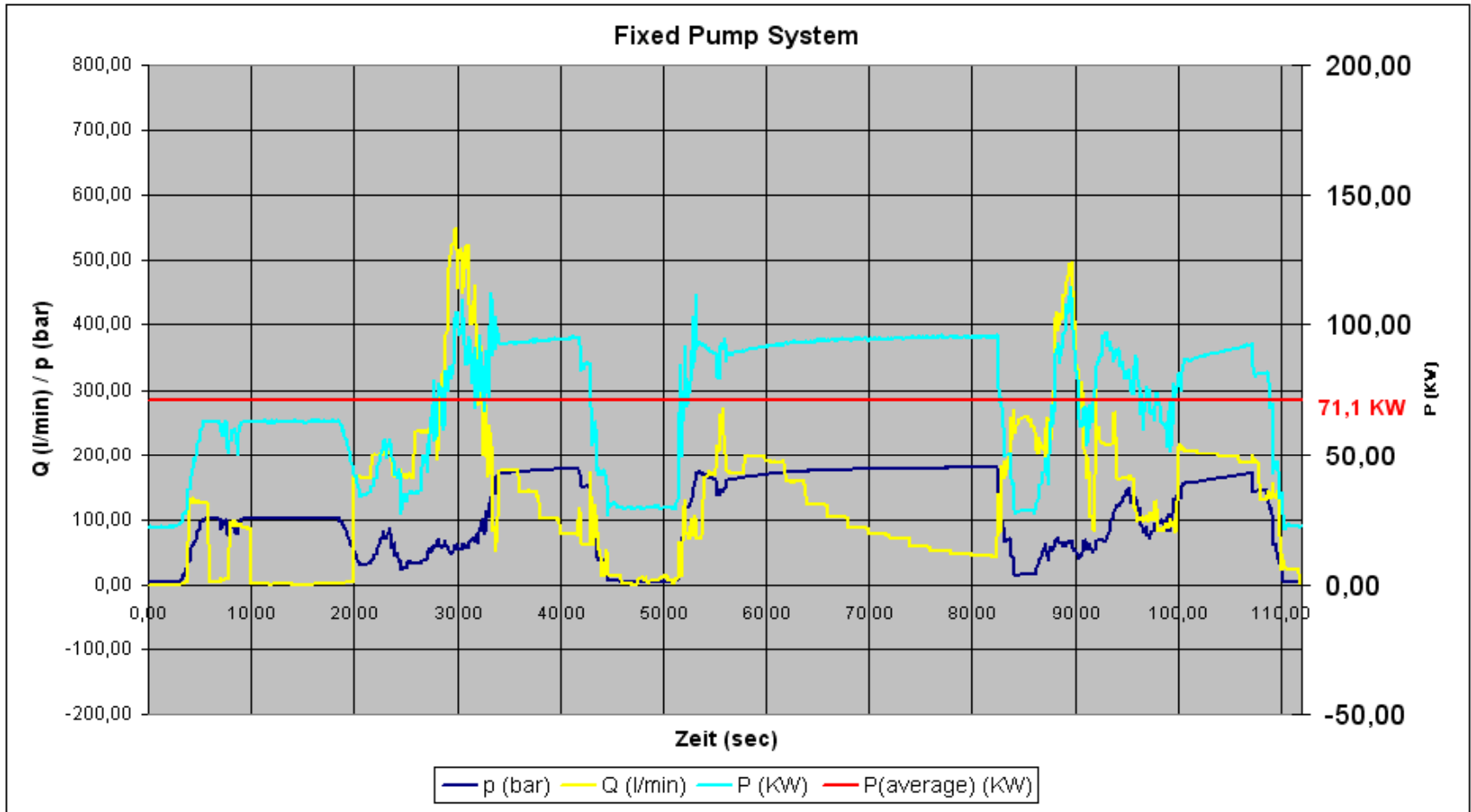
# Energy Saving at Die Cast Machines with Bosch Rexroth

## Energy losses at the old fixed pump system depending on the flow into the system

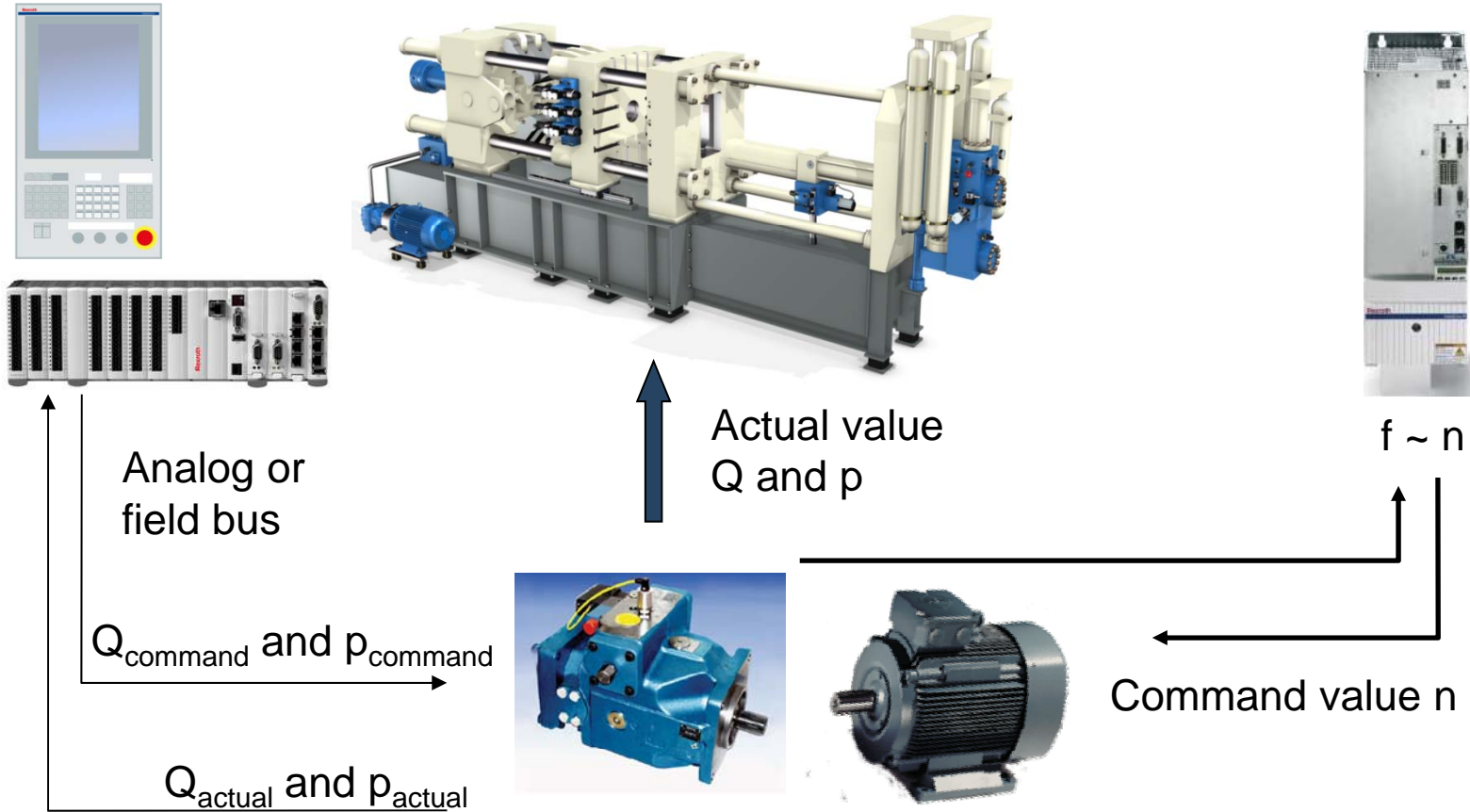


# Energy Saving at Die Cast Machines with Bosch Rexroth

Energy measurements at an old 1600t die cast machine / 16.04.2011



# Energy Saving at Die Cast Machines with Bosch Rexroth

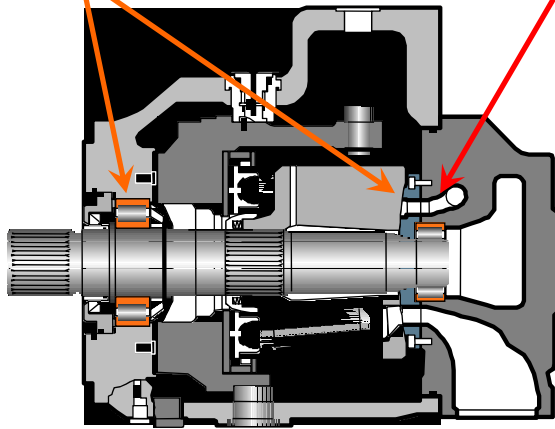


**die casting machine with DFEn and variable speed**

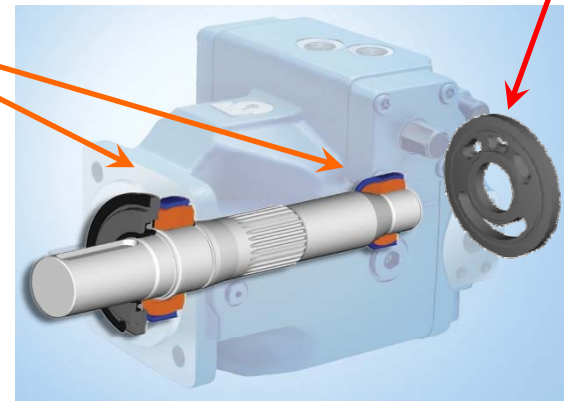
# Energy Saving at Die Cast Machines with Bosch Rexroth

## New pump for HFC fluid

**E-A4VSO old design with roller bearings and 3-hole distribution plate**



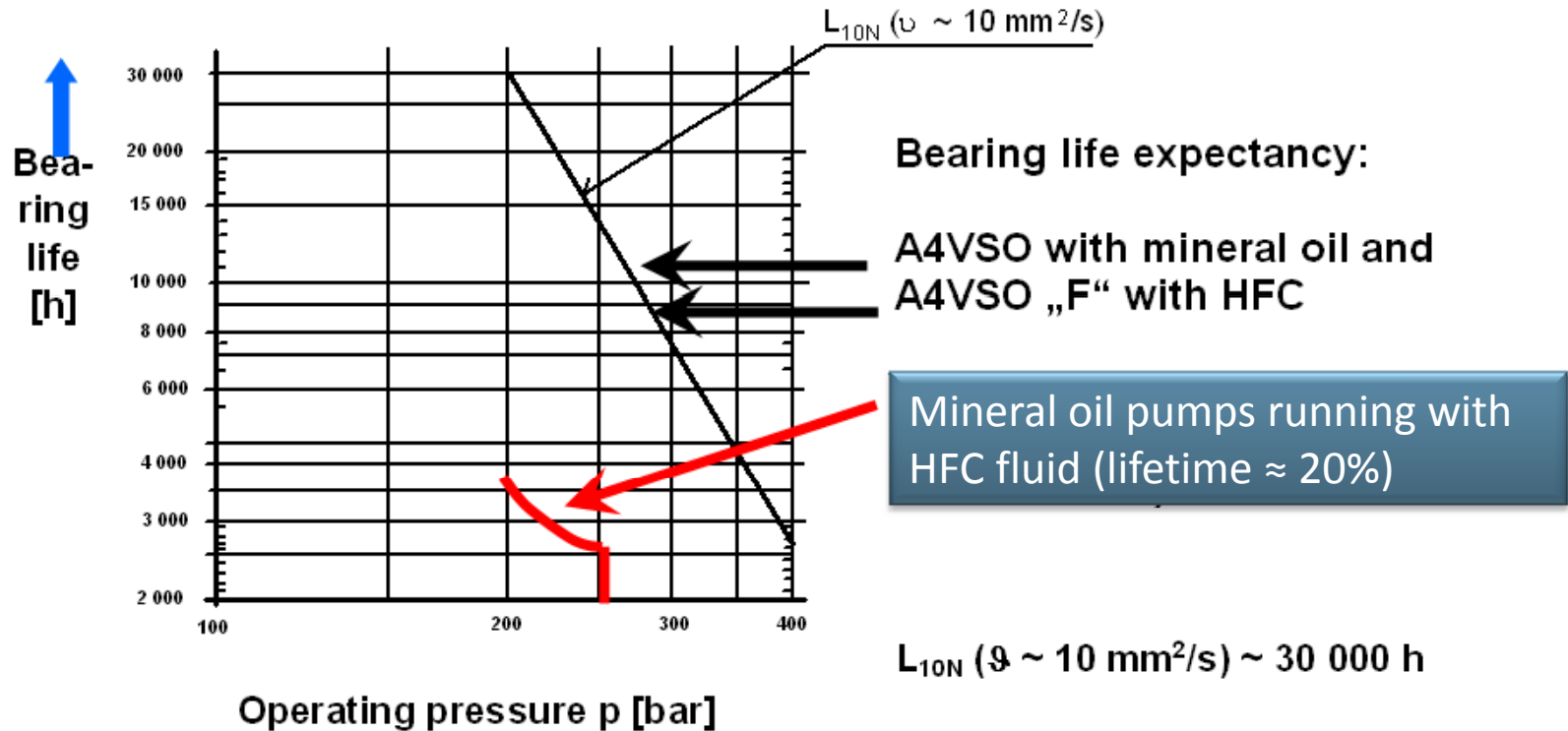
**A4VSO new design „F“ with plain bearings and cavitations optimized distribution plate**



		A4VSO... E (existing pump)					A4VSO.../30...-F (new HFC pump)				
size		71	125	180	250	355	71	125	180	250	355
drive speed	(1/min)	1760	1450	1450	1200	1200	1800	1800	1800	1500	1500
pressure	(bar)	250	250	250	250	250	350	350	350	350	350
max. pressure	(bar)	280	280	280	280	280	400	400	400	400	400
approved: Fuchs Hydrotherm 46; Petrofer Ultrasafe 620; Fuchs Renosafe 500; Houghton Hougotosafe 620; Union Carbide HP 5046;											



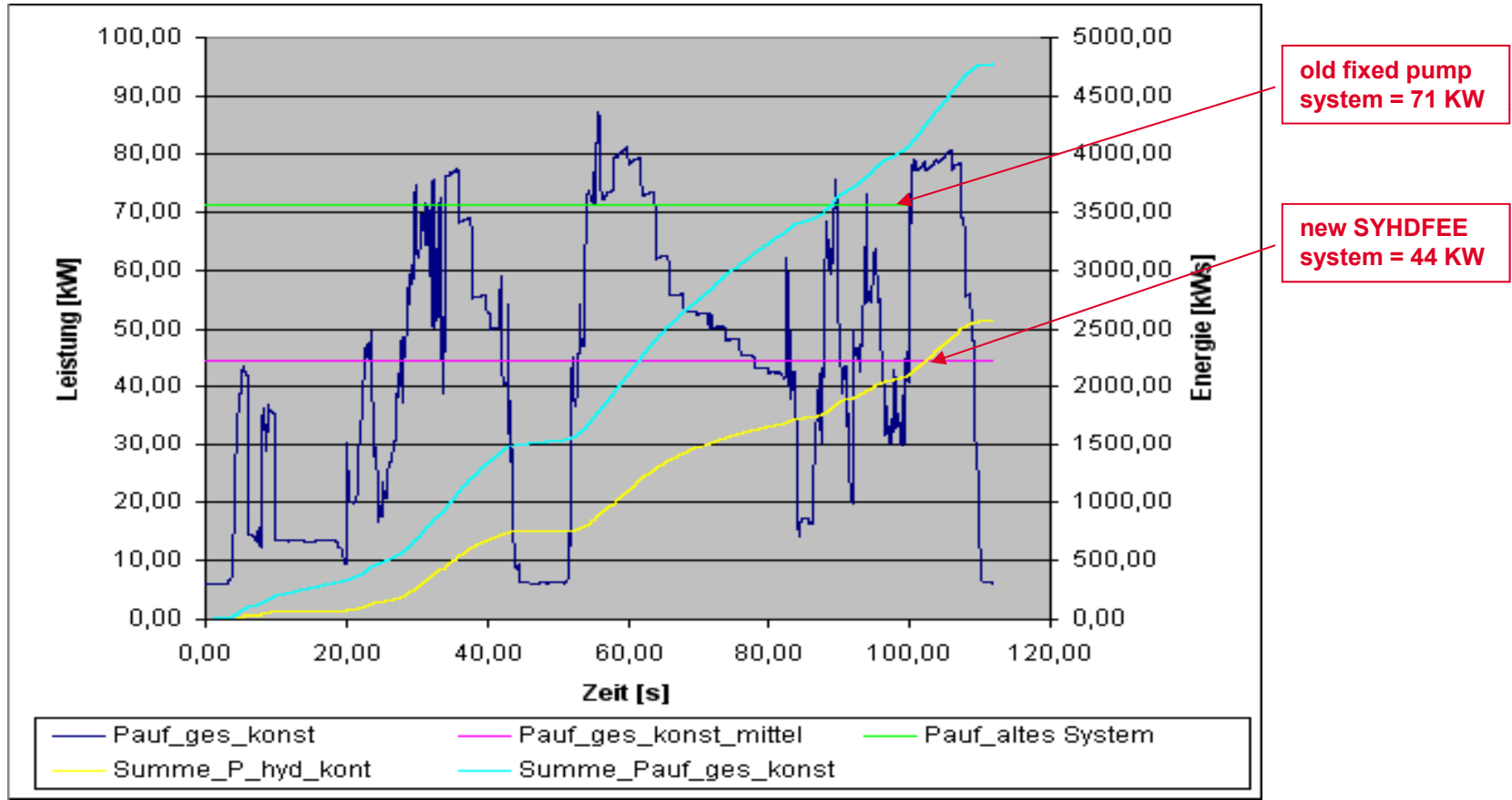
# Energy Saving at Die Cast Machines with Bosch Rexroth



# Energy Saving at Die Cast Machines with Bosch Rexroth

## Calculation of energy saving if using Bosch Rexroth SYHDFEE system / 24.05.2011

(variable piston pump with electronic flow and pressure control without frequency converter)



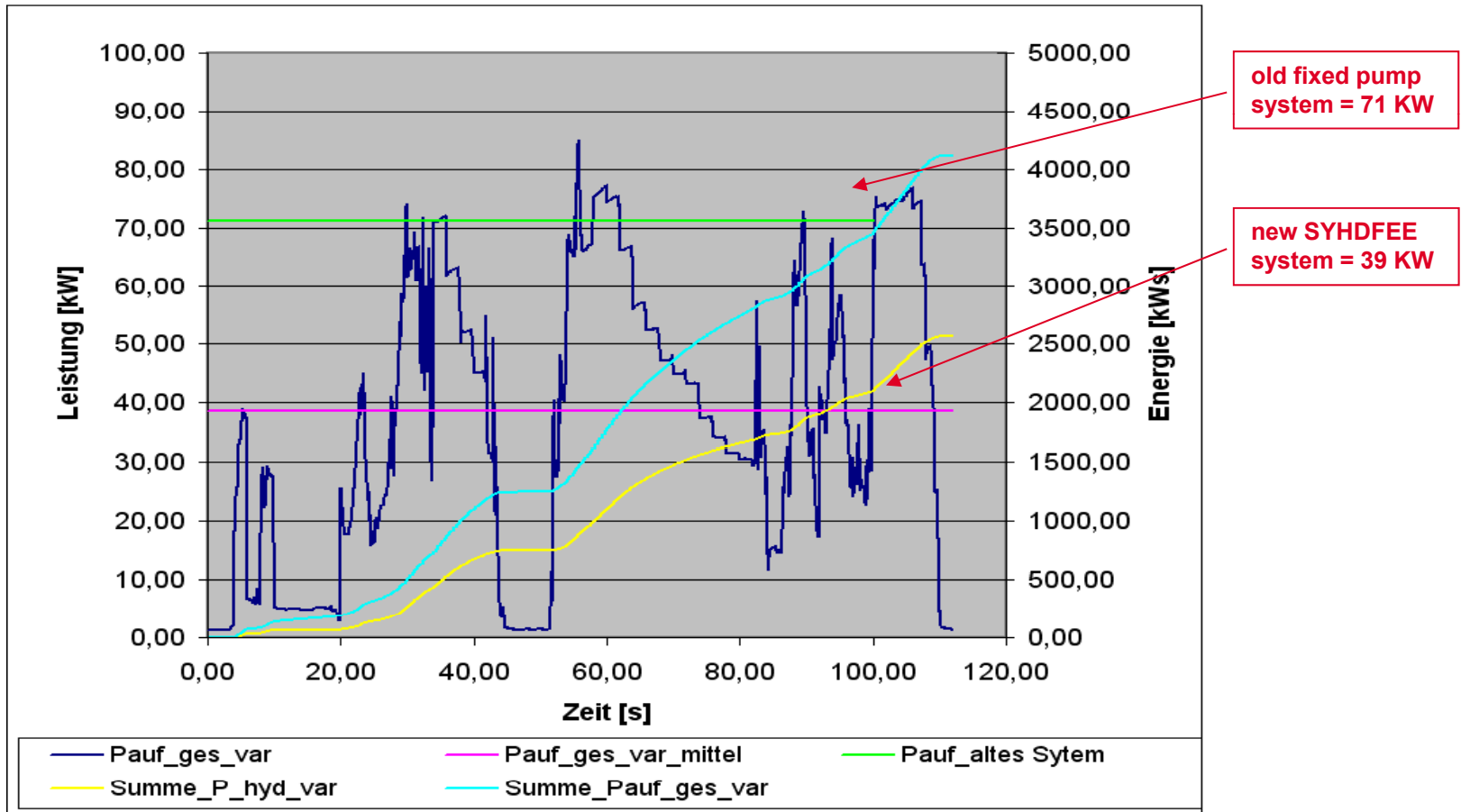
old fixed pump system = 71 KW

new SYHDFEE system = 44 KW

# Energy Saving at Die Cast Machines with Bosch Rexroth

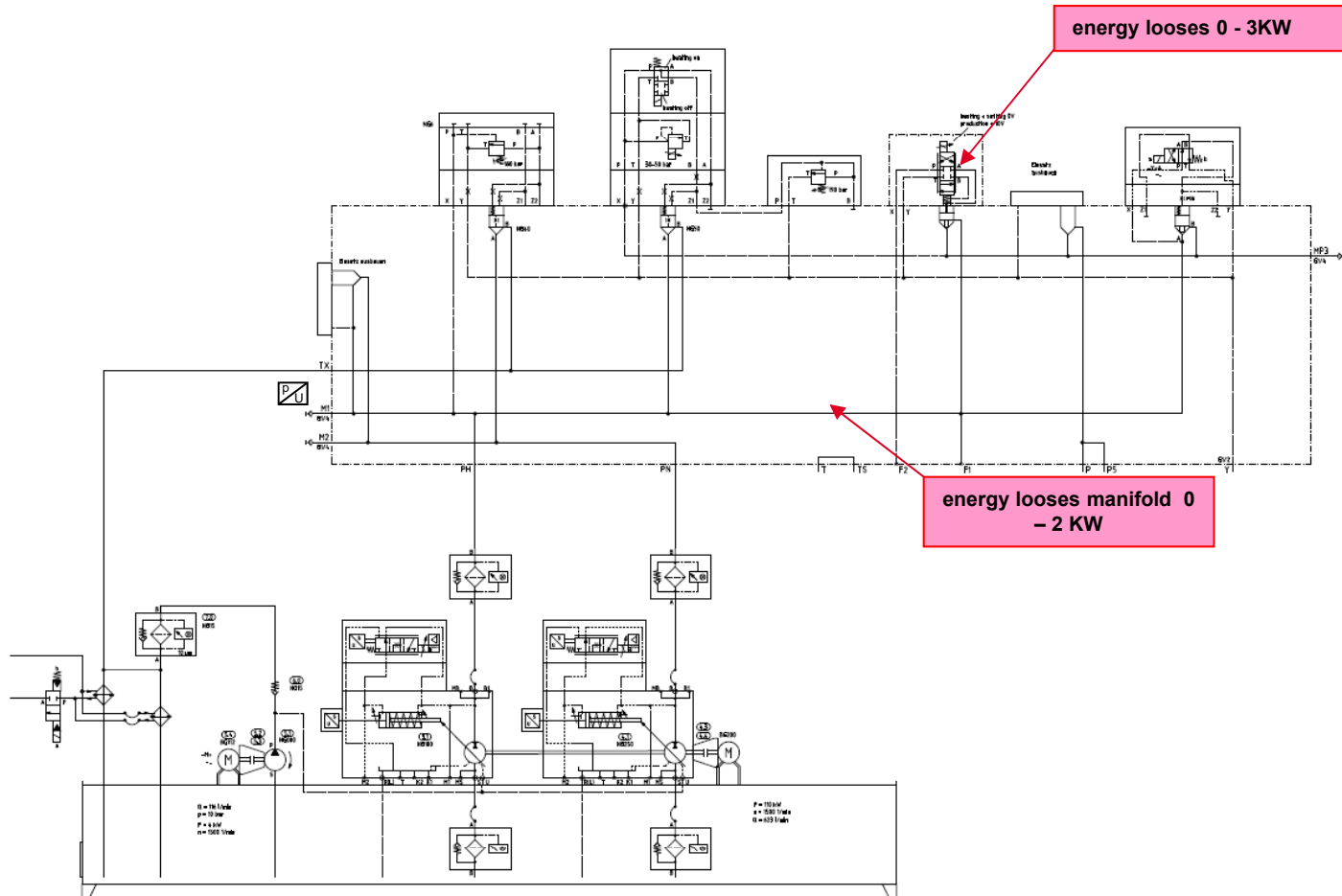
## Calculation of energy saving if using Bosch Rexroth SYHDFEn system / 24.05.2011

(variable piston pump with electronic flow and pressure control and frequency converter)



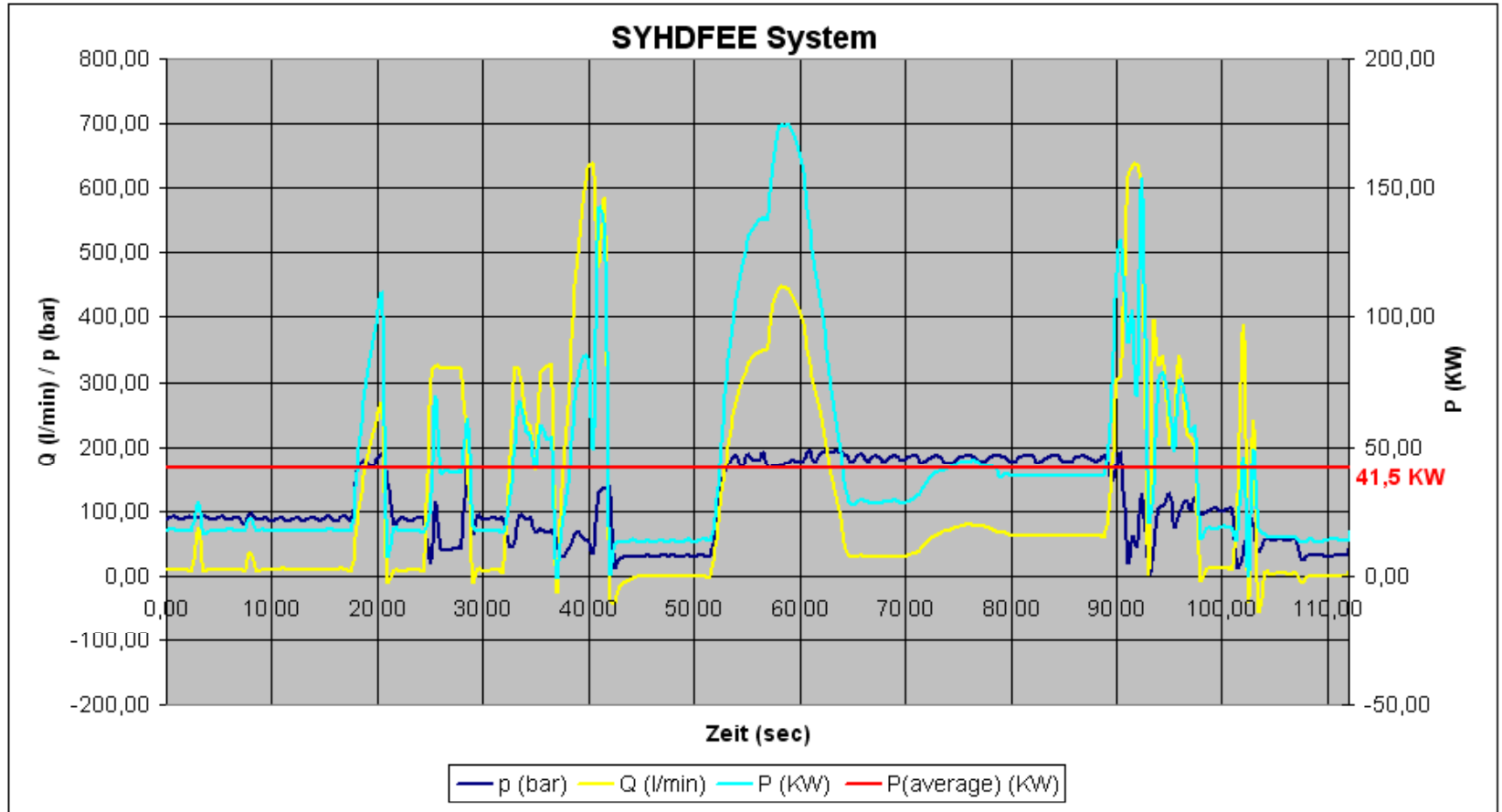
# Energy Saving at Die Cast Machines with Bosch Rexroth

## Energy losses at the new SYHDFEE pump system after modification



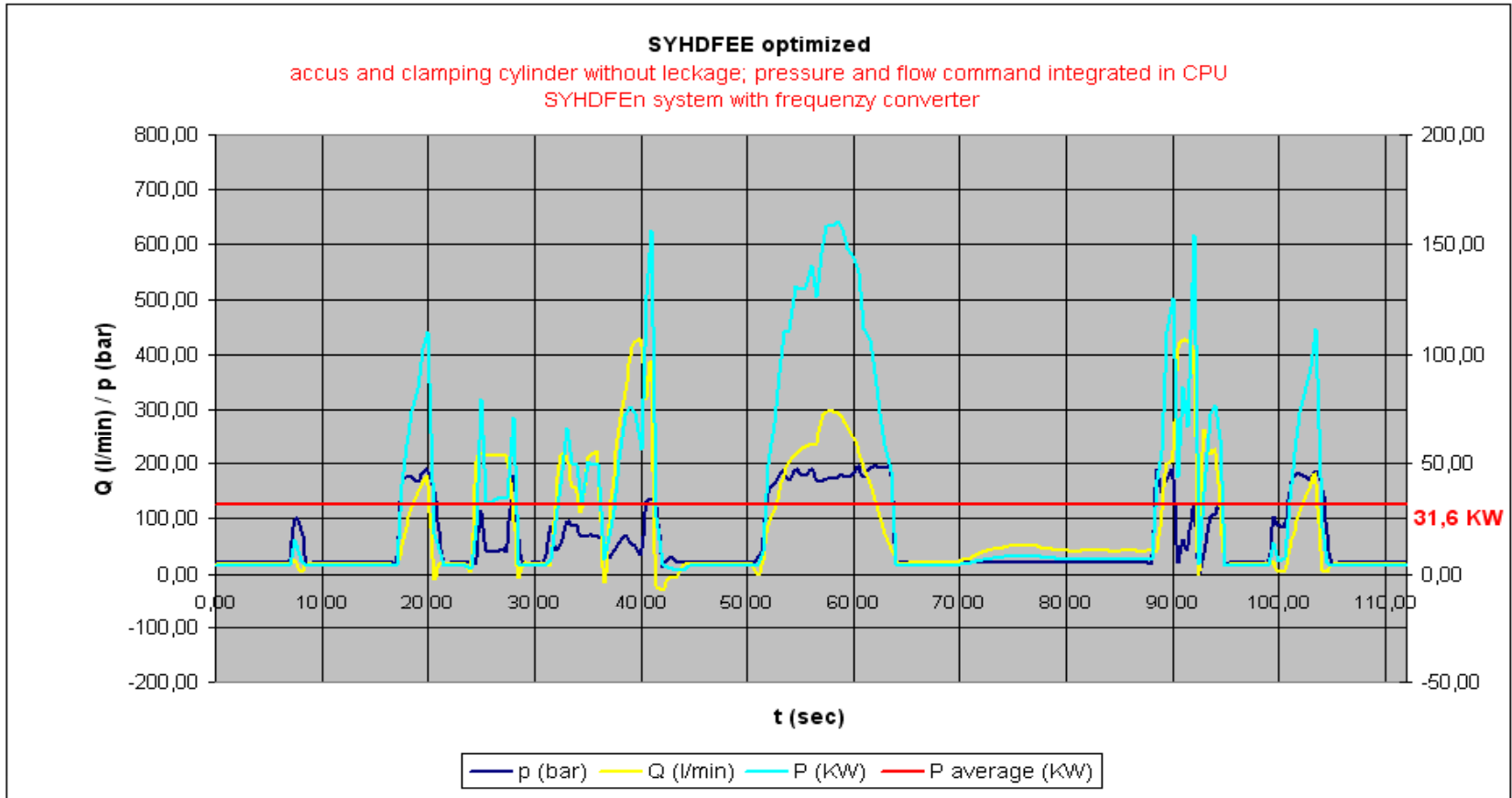
# Energy Saving at Die Cast Machines with Bosch Rexroth

Energy measurements at an old 1600t die cast machine after modification / 28.02.2012

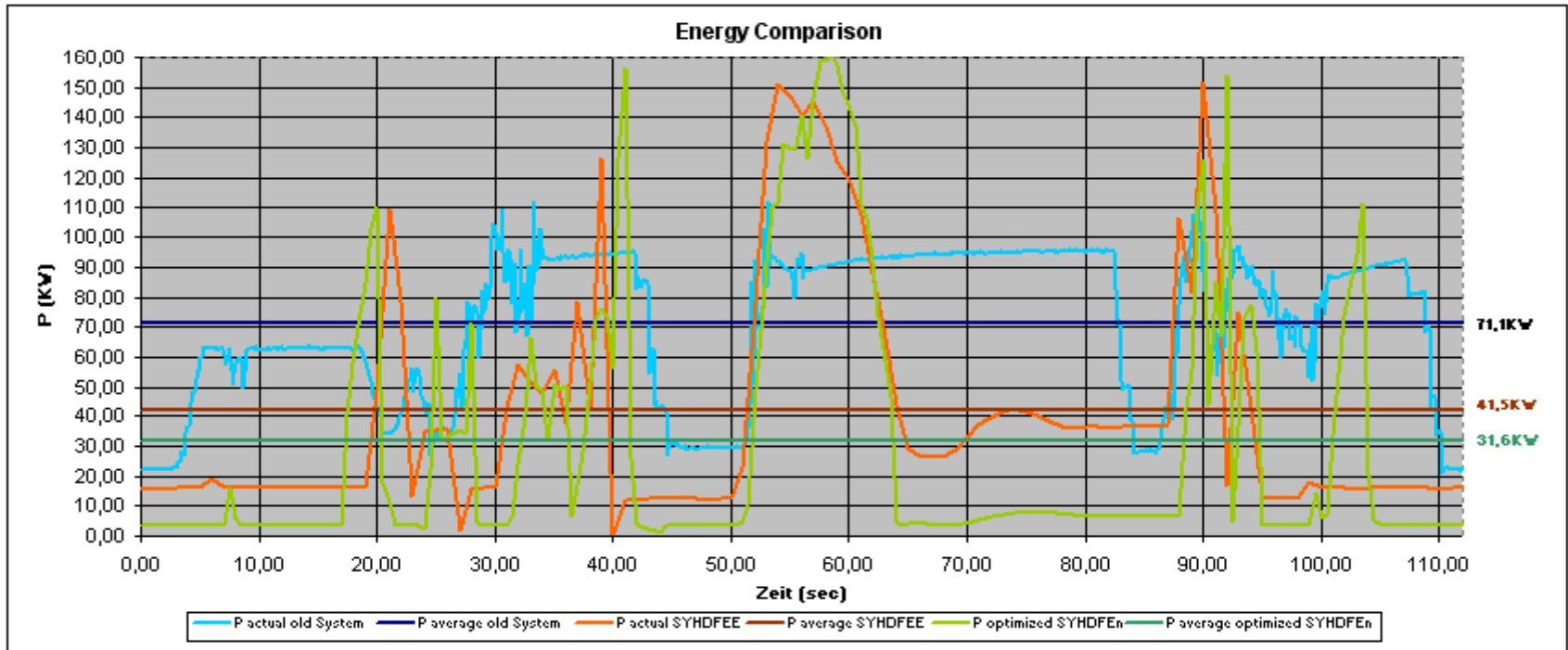


# Energy Saving at Die Cast Machines with Bosch Rexroth

Energy consumption which is possible at a new optimized 1600 to die cast machine and using SYHDFEn system (DFEn 5000)



# Energy Saving at Die Cast Machines with Bosch Rexroth



## Cost reducing if using SYHDFEE system at an old die cast machine

P average old system =	<b>71,10</b> KW	100 %
P average SYHDFEE =	40,23 KW	
P Cooling/Filter =	1,25 KW	
P new system =	<b>41,48</b> KW	57 %
Energy saving =	<b>30,87</b> KW	43 %
Working time =	<b>5250</b> h	
Energy costs =	<b>0,10</b> €/KWh	
cooling costs =	<b>0,01</b> €/KWh	

**Energy costs saving = 17825,80 |**

## Cost reducing if using SYHDFEE system and new optimized die cast machine

P average old system =	<b>71,10</b> KW	100 %
P average SYHDFEE =	30,37 KW	
P Cooling/Filter =	1,25 KW	
P new system =	<b>31,62</b> KW	43 %
Energy saving =	<b>40,73</b> KW	57 %
Working time =	<b>5250</b> h	
Energy costs =	<b>0,10</b> €/KWh	
cooling costs =	<b>0,01</b> €/KWh	

**Energy costs saving = 23522,65 |**

## Noise reduction at SYDFEE pump systems

### Optimize hydraulic and mechanic installation

Noise reduction 2- 4 dB(A)

- Optimization of the controller adjustment (DFEE-system)
- Reduction of the pulsation with additional tubes
- Reduction of parts vibration
- Cast iron bell housing

### Assembling of a noise reduction housing for pump; bell housing and motor

Noise reduction 7 - 10 dB(A)

### Use frequency converter to save additional energy

Noise reduction of about 5 - 10 dB(A) by speed reduction during high pressure and in average

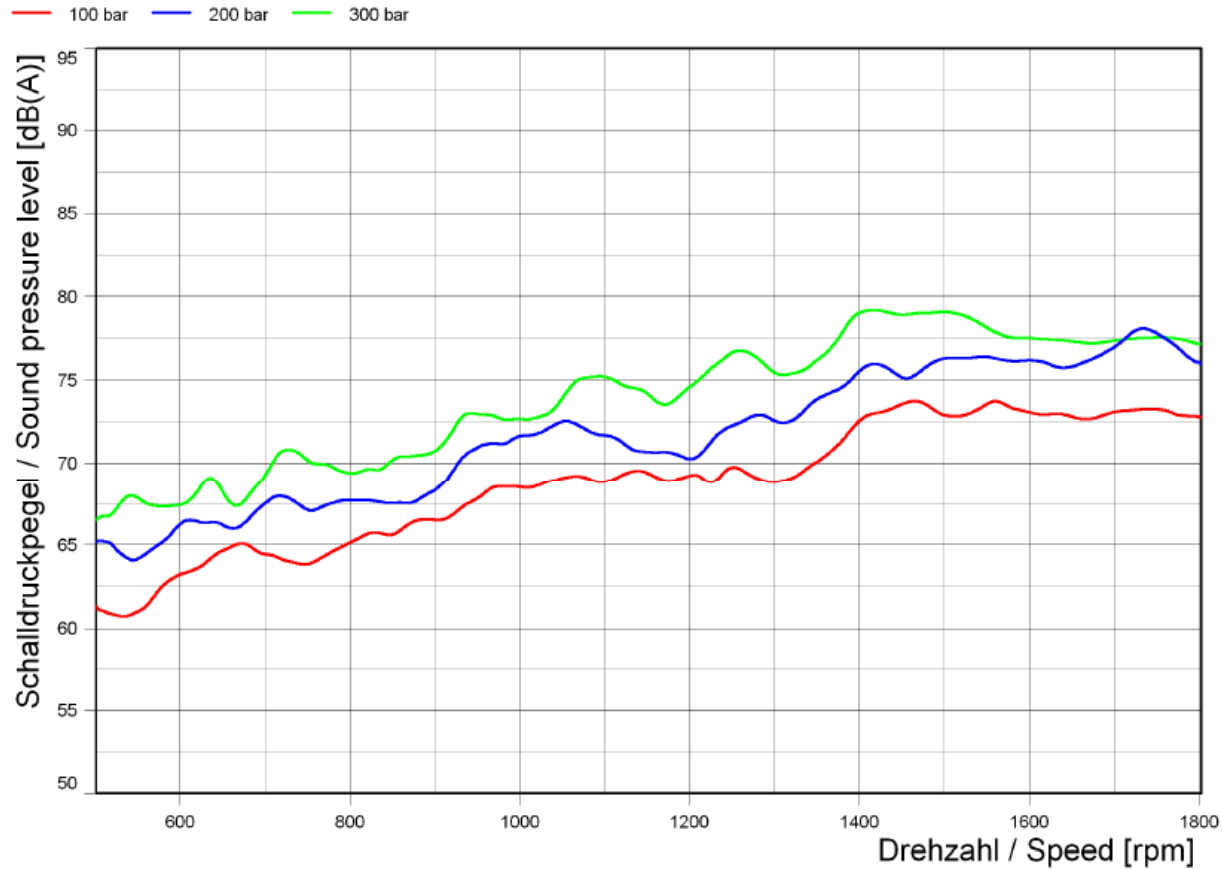
- **additional energy saving ~ 10%**

Tab. 1 User measurement and comparison with other equipment with the same load featuring the old P-Q system.

Nr. machine	time measurement [min]	energy consumption [kWh]	Note
MW 44	120	442	P-Q
MW 45	120	439	P-Q
MW 46	120	454	P-Q
MW 47	120	231	DFEn5000



## Sound pressure level - A4VSO.180/30



# Energy Saving at Die Cast Machines with Bosch Rexroth

**THANK YOU FOR YOUR ATTENTION**

