

RESIDUAL RESOURCE DIAGNOSTICS

MEDICAL DIAGNOSTICS

TECHNOGENIC DIAGNOSTICS

ANTI-TERRORIST DIAGNOSTICS

ECOLOGICAL DIAGNOSTICS



Residual Resource Diagnostics

Evaluation

Measurements

Testing

Diagnostics parameters: Technical, Physical, Economical

Damages and failures – Data Bank

Physic-Mathematical Model of the Object

Safety

Medical

X-ray Diagnostics
Tomography
Chemical analysis
Sonic imaging
Thermal imaging
Cardiology, etc.

Technogenic

Flaw detection
Instroscopy
Microscopy
Structural analysis
Size control
Vibration analysis
etc.

Ecological

Forecast of
earthquakes,
floods, level of
radioactive,
chemical and gas
pollution of
environment
(atmosphere,
soil, biotic and
territories, etc.)

Anti-terrorist

Detection of:
weapons, including
(nuclear, chemical,
explosives, mines,
munitions); drugs,
criminals;
Screening of
luggage, parcels,
transportation
means,
false documents,
etc.

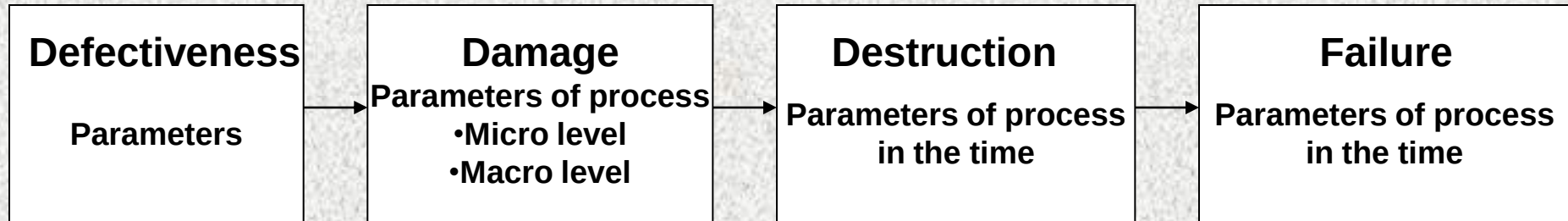
Physical parameters of diagnostics

Groups of Parameters	Parameters
Kinematic	Time, velocity, acceleration, frequency, phase, etc.
Geometric	Length, area, angle, curvature, etc.
Statistical and dynamic	Mass, force, pressure, work, energy, power, etc.
Mechanical and molecular	Density, specific gravity, elastic modulus, hardness, impact viscosity, yielding, etc.
Thermal	Temperature, temperature gradient, entropy, heat absorption, heat conduction coefficient, etc.
Acoustic	Sound pressure, volume velocity, sound energy, mechanical resistance, sound intensity, etc.
Electrical and magnetic	Electric charge, electric-field stress, potential, capacity, dielectric conductivity, electrical resistance, magnetic induction, inductivity, magnetic permeability, etc.
Radiation	Radiation flow, radiation energy, spectral concentration, illumination, brightness, light intensity, reflection, absorption and transmission coefficients, etc.
Atomic physics	Moment of momentum, absorbed radiation dose, exposure dose, radioactivity, etc.
Universal physical constant	Speed of light in vacuum, gravity constant, electron, proton, neutron mass, electron-magnetic moment, etc.

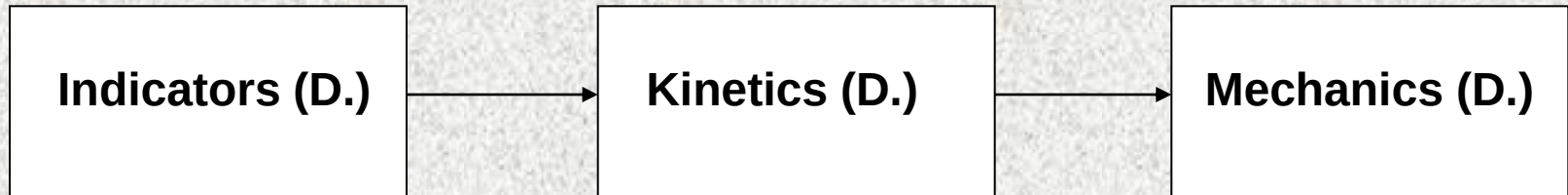
Physical methods of diagnostics

Physical radiation and emission fields, methods, phenomena	Ecological				Technogenic			Anti-terrorism				Medical (sales volume 100%)
	Earth	Water	Air	Airspace	Production	Operation	Storage	Securities	Arms	Explosives drugs	Protection	
Low frequency (0-10 ³ Hz)	+				+	+	+		+			
Radiowaves (10 ⁴ – 10 ¹⁰ Hz)	+		+	+	+	+	+		+	+	+	+
Infrared (10 ¹¹ – 4x10 ¹⁴ Hz)	+	+	+	+	+	+	+	+	+		+	+
Visible (4x10 ¹⁴ – 7.5x10 ¹⁴ Hz)		+	+	+	+	+	+	+			+	+
Ultraviolet (7.5x10 ¹⁴ – 3x10 ¹⁶ Hz)			+	+	+	+	+	+				+
X-ray (3x10 ¹⁶ – 3x10 ²⁰ Hz)	+			+	+	+	+	+	+	+	+	+50%
Gamma (3x10 ¹⁹ – 3x10 ²² Hz)	+			+	+							+10%
Cosmic (3x10 ²¹ Hz)				+								
Corpuscular emission (neutrons, protons, electrons, positrons)	+			+	+					+		
Permanent magnetic field	+		+	+	+	+	+	+	+		+	+
Electric field	+	+			+	+	+					+10%
Ultrasonic field	+											+20%
Vibration, noise, impact	+	+	+		+	+	+				+	
Mechanical and chemical parameters measurements (time, size, force, pressure, mass, concentration, relative molecular mass, etc.)	+	+	+	+	+	+	+			+		+
Penetrant Testing	+				+	+	+	+				+
Volume of sales (100%)	10%				20%			20%				50%

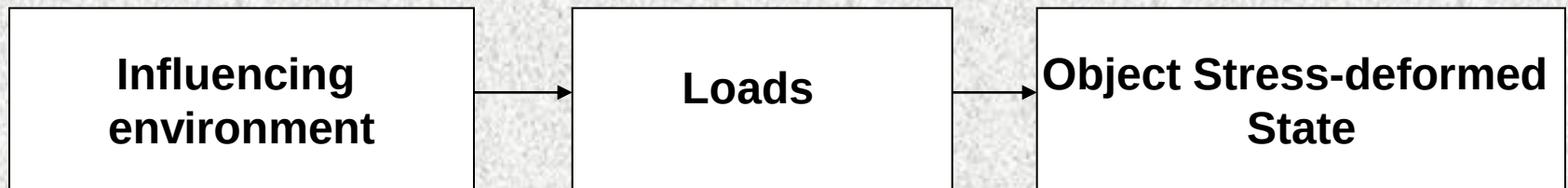
Object Diagnostics



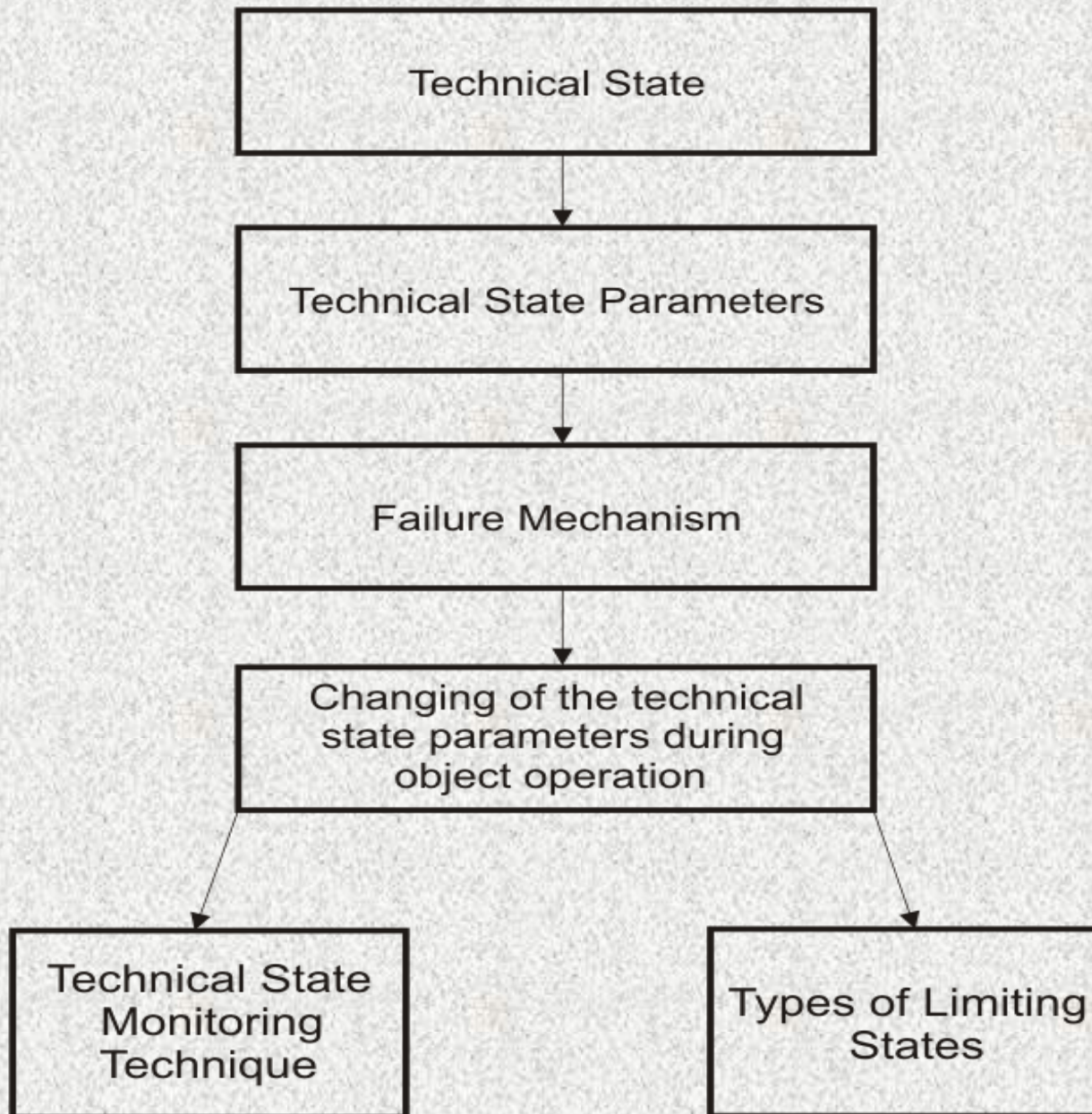
Object Degradation (D.) Diagnostics



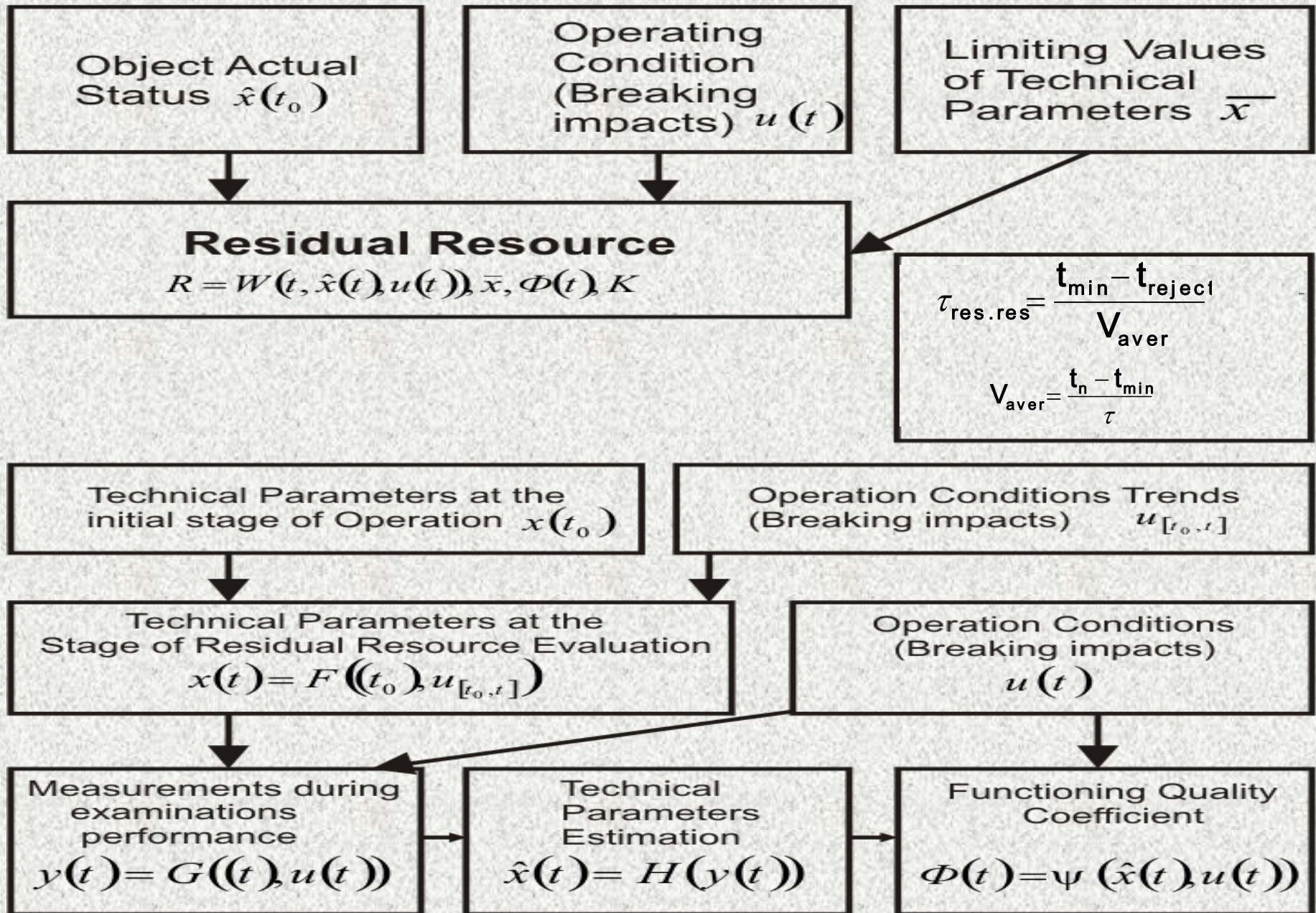
Environment Diagnostics



Residual Resource of the object technical state



Residual Resource of the object



Mathematical model of the object residual resource calculations

$$R(t) = W(t, \hat{x}(t), u(t), \bar{x}, \Phi(t), K) \quad - \text{Residual resource evaluation}$$

$$x(t) = F\left(x\left(t_0\right), u_{[t_0, t]}, K, M_{[t_0, t]}\right) \quad - \text{State}$$

$$y(t) = G(x(t), u(t)) \quad - \text{Measurements}$$

$$\hat{x}(t) = H(y(t)) \quad - \text{Evaluation}$$

$$\Phi(t) = \psi(\hat{x}(t), u(t)) \quad - \text{Estimation of the object actual state}$$

$x(t)$ – vector of diagnostic parameters

$y(t)$ – means measurements

$\Phi(t)$ – estimation of technical condition vector

$\hat{x}(t)$ – object actual state estimation at given moment of time

$R(t)$ – residual resource evaluation at the moment of time

$\bar{x}$ – technical parameters limiting values

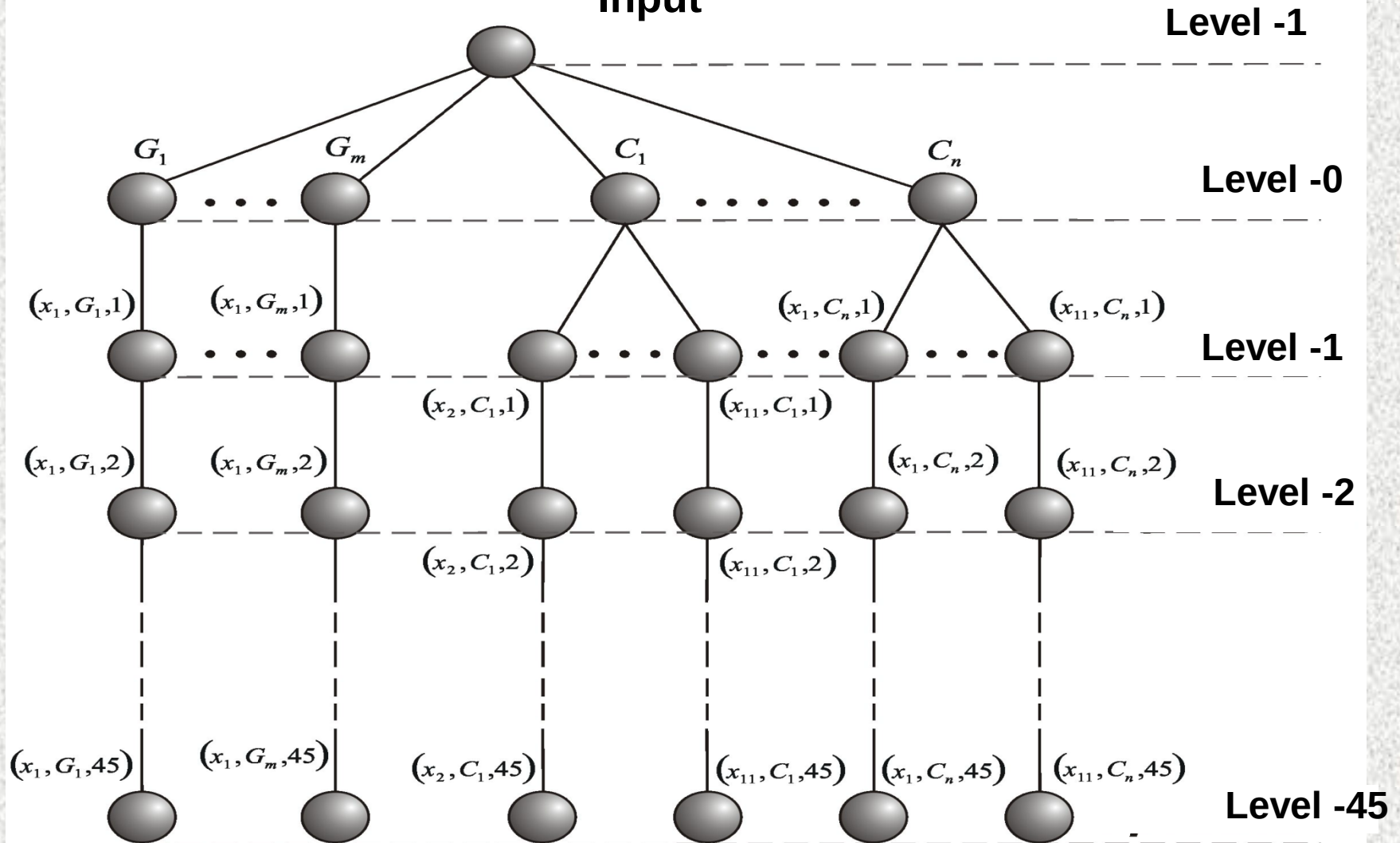
$u(t)$ – object operation conditions at the current moment of time

$u_{[t_0, t]}$ – object operation conditions for the time interval

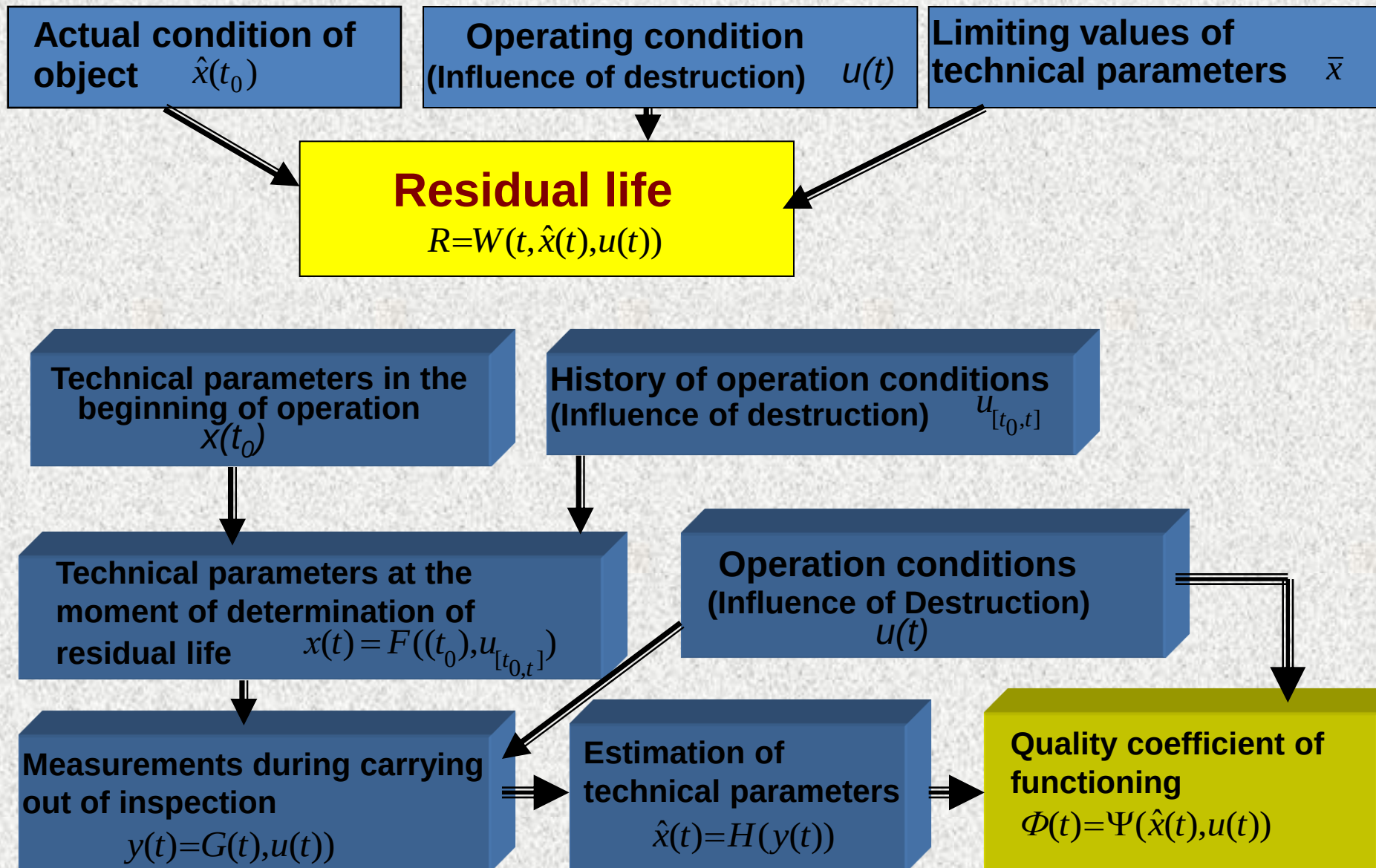
K – vector, characterizing object operation mode

DIAGNOSTIC TREE for RESIDUAL RESOURCE EVALUATION

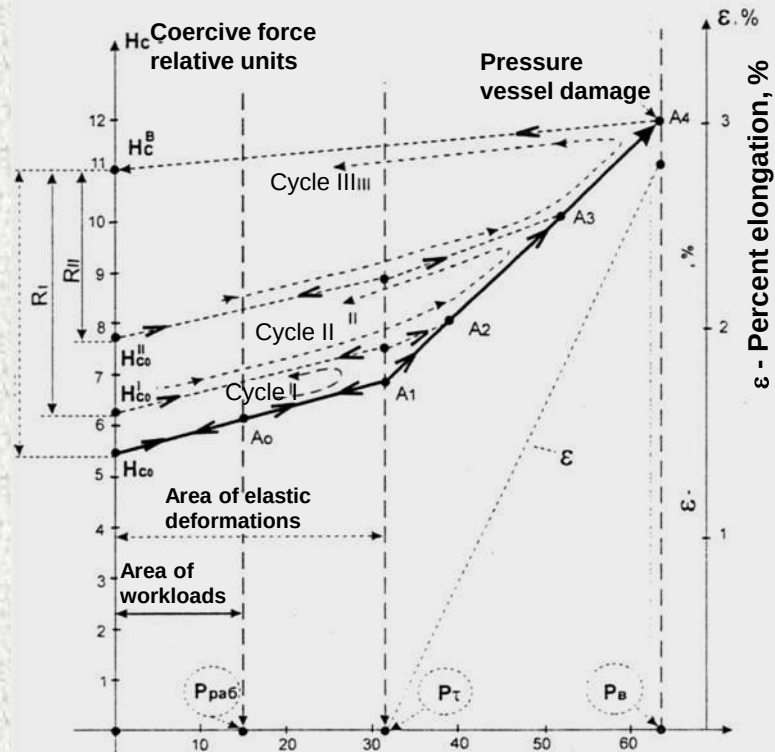
Input



RESIDUAL RESOURCE of OBJECT



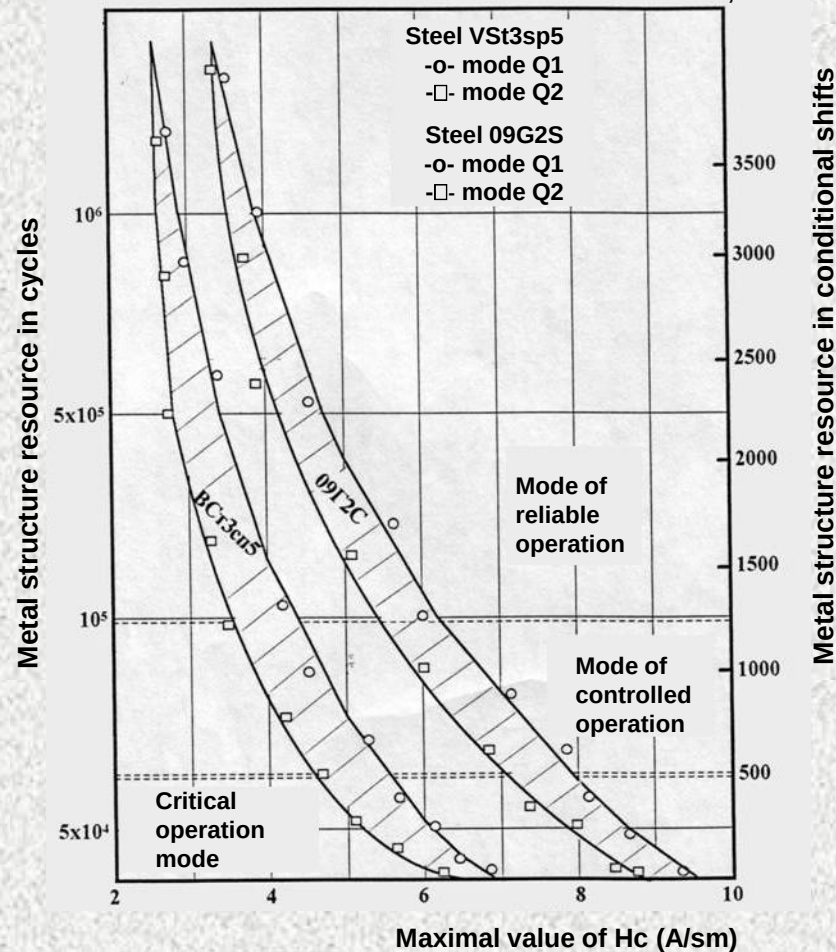
RESIDUAL RESOURCE BY MEANS OF MAGNETIC TESTING



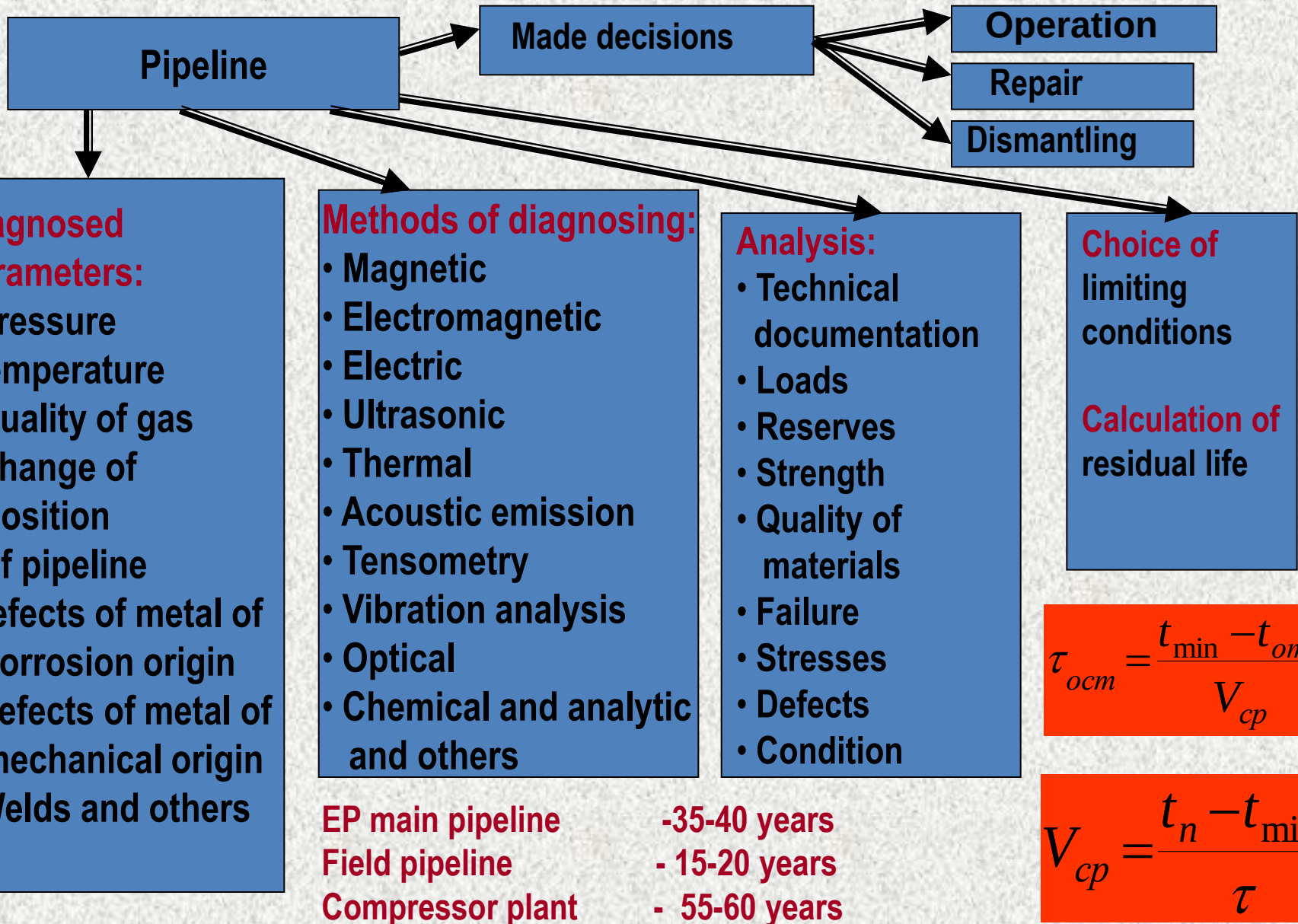
P_w – working pressure
 P_τ , P_B – yield point and ultimate stress pressures
 I, II, III – loading cycles

№ of cycles

C, shifts



EVALUATION of RESIDUAL RESOURCE of PIPELINE

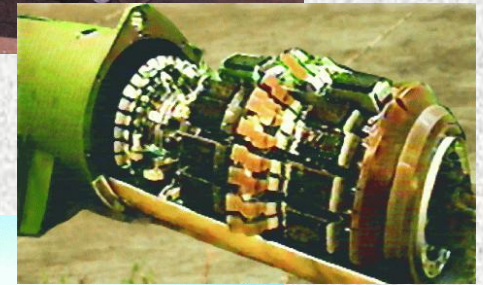
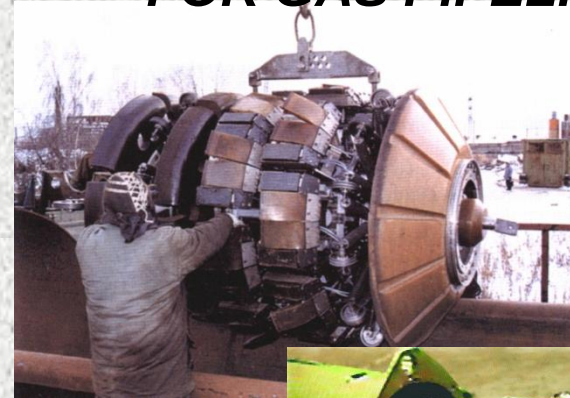


Technogenic Diagnostics

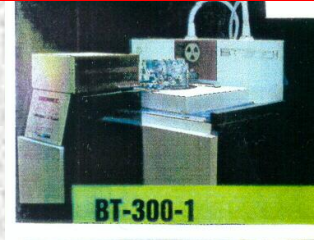
10-30% expenses



MAGNETIC FLAW DETECTOR FOR GAS PIPELINE



COMPUTER TOMOGRAPHY



Products of the Research Institute of Introscopy

Medical Diagnostics

МЕДИЦИНСКАЯ ДИАГНОСТИКА



КРД-СМ 50/125-1



ФСЦ-У-01



АМЦР-1



Анков-01

Technogenic Diagnostics



А1220 монолит



АКР1224



АД-64М



РТИ



JME-24-1



Очертание ТВ



В & G



Негатоскоп серии ОД



ОФ-10ДЦМ



ВД-87Нст



ВД-12НФП



ВД-89НП



Магнитный

МФ-10СП



Магнитный

УФО-3-3500



Оптический

SPECTR MET-M



Оптический

МПМ-2У



Магнитный

УН-5



Тепловой

Катран-3



Тепловой

Скат-2



Тепловой

КМ

Gauges for Size Control

Измерители размеров



Ультразвуковой

А1207



Ультразвуковой

УК1401



Электромагнитный

КРМ-Ц-ДЕЛЬТА



Электромагнитно-акустический

ЭМАТ-100



Электромагнитный



Рентгеновский



Электро-магнитный структуроскоп



Магнитный структуроскоп

Anti-terrorism Diagnostics



Катран-2



Гранат



Эдельвейс МП



ФПД-1000



Анти-терроризм



Анти-терроризм



Анти-терроризм



Анти-терроризм

Ecological Diagnostics



Магнитометр

МФ-23ИМ



Грассопиловский прибор

ОНИКС



Грассопиловский прибор

FM 9800XT



Прибор контроля кабелей связи

КМК-67

Комплексные передвижные лаборатории



